Scanning - Shortwave - Ham Radio - Equipment
Internet Streaming - Computers - Antique Radio

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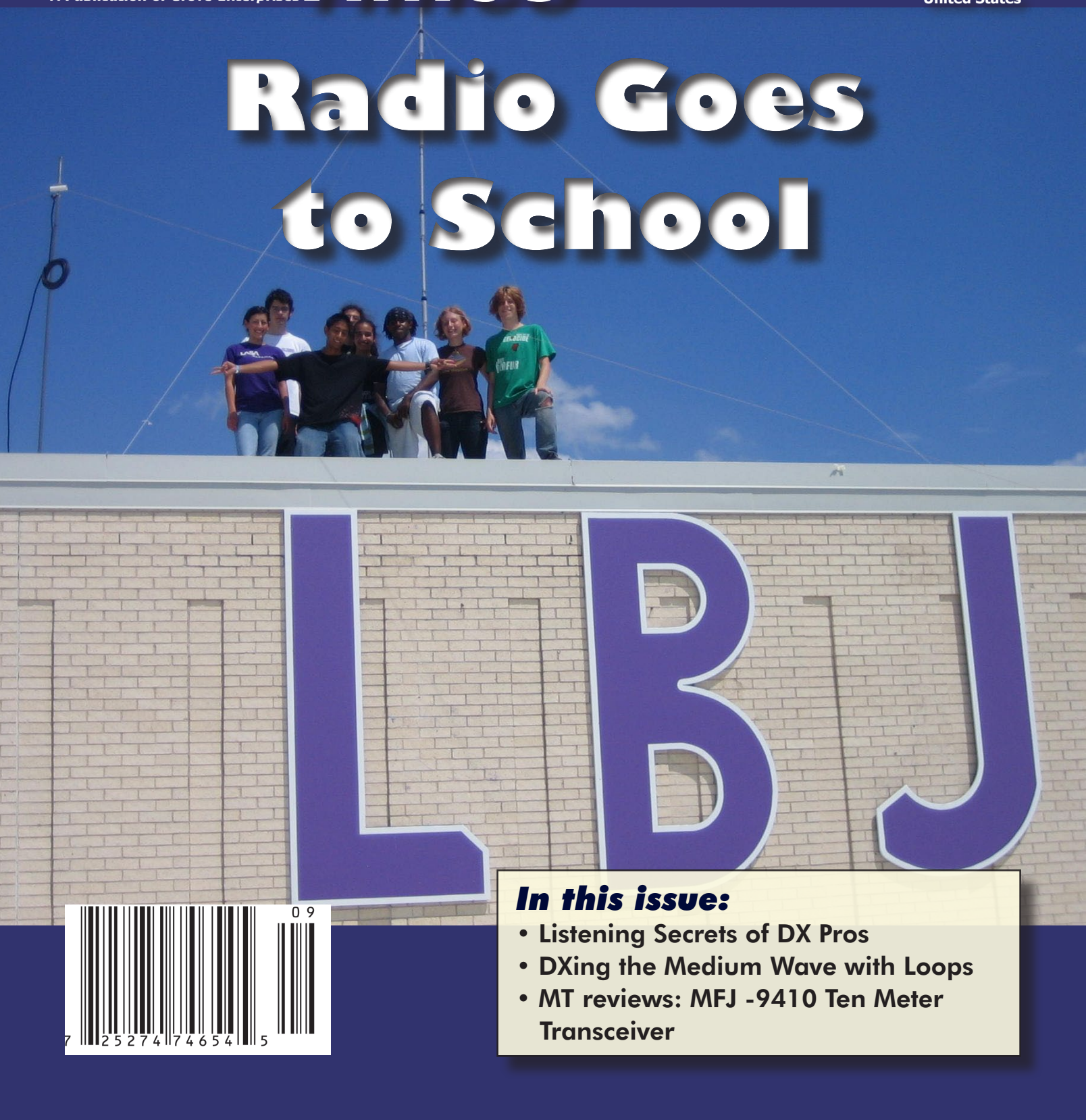
Radio Goes to School



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- Listening Secrets of DX Pros
- DXing the Medium Wave with Loops
- MT reviews: MFJ -9410 Ten Meter Transceiver

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AR5001D Wide Coverage Professional Grade Communications Receiver

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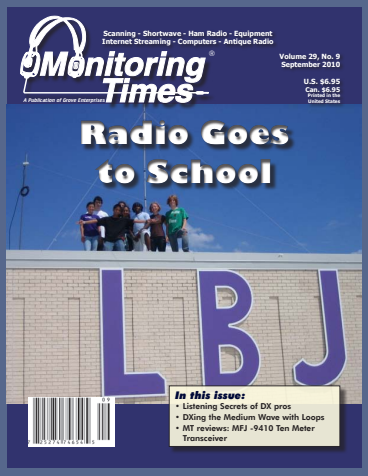
Vol. 29 No. 9 September 2010



Radio and American Education 8

By Ken Reitz KS4ZR

Hundreds of public and private schools across the U.S. offer courses in amateur radio or have an active amateur radio club. From elementary through graduate school, radio is being taught in more classrooms and engaging more students than ever before. In addition, several hundred thousand dollars are awarded each year to aspiring graduates, just for having earned an amateur radio license and being involved in radio.

On Our Cover

Students from K5LBJ, club station of Liberal Arts & Sciences Academy at L.B.J. High School Austin, Texas, on the roof of their school after successfully raising their vertical antenna for operation. They also painted the club call sign on the roof so that it's visible via Google satellite. (Courtesy: Ronny Risinger KC5EES)

C O N T E N T S

R E V I E W S

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Subscription Questions?
belinda@grove-ent.com

Owners
Bob and Judy Grove
judy@grove-ent.com

Publisher
Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Managing Editor
Rachel Baughn, KE4OPD
editor@monitoringtimes.com

Assistant and Reviews Editor
Larry Van Horn, N5FPW
larryvanhorn@monitoringtimes.com

Features Editor
Ken Reitz
kenreitz@monitoringtimes.com

Art Director
Bill Grove

Advertising Services
Judy Grove
(828) 837-9200
judy@grove-ent.com

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You may contact any MT staff writer by email by combining their ***first and last name @ monitoringtimes.com.*** By postal mail, you may write them in care of MT Headquarters in Brasstown. Please enclose a self-adressed, stamped envelope if you wish the columnist to reply.

AR-ALPHA

Communications Receiver

- Multi-mode unit capable of receiving AM (synchronous), ISB, RZ-SSB, USB, LSB, CW, WFM including FM stereo, NFM, APCO-25 digital, and TV in both NTSC and PAL formats
- 6-inch TFT color panel can display received video signals or depict spectrum activity over a wide choice of bandwidths including a "waterfall" function to show signal activity over a specified time period

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AOR proudly introduces the AR-ALPHA, the first in a new class of professional monitoring receivers! Designed to cover 10KHz to 3.3GHz, with no interruptions,* this receiver features a 6-inch color TFT display, five VFOs, 2000 alphanumeric memories that can be computer programmed as 40 banks of 50 channels, 40 search banks, a "select memory" bank of 100 frequencies, and a user designated priority channel. It includes APCO-25 digital and a DVR with six channels that can record up to a total of 52 minutes audio. Monitoring professionals will appreciate the world class engineering and attention to detail that makes the AR-ALPHA such an amazing instrument.

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- CTCSS and DCS selectable squelch functions
- DTMF tone decode
- Built-in voice-inversion descrambling
- CW pitch control, AGC, AFC
- Auto-notch feature
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- Resolution bandwidth is also user-selectable in increments of 1 KHz, 4 KHz, 32 KHz, 64 KHz, and 128 KHz.
- Fast Fourier Transform (FFT)
- Rear panel connections include 12 VDC power, RS-232C, USB 2.0, I/Q output with 1 MHz bandwidth, two antenna ports (one SO-239 and one Type N) and up to four antennas may be selected through the receiver's controls with the optional AS5000 antenna relay selector.
- Use desktop or with 19" rack mount

The AR-ALPHA redefines excellence in professional monitoring receivers. No wonder so many monitoring professionals including government, newsrooms, laboratories, military users and more, rely on AOR.

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COMMUNICATIONS

by Ken Reitz

AMATEUR/SHORTWAVE RADIO

Spies like Us

It was the summer spy story that kept our minds off the Gulf of Mexico for at least two weeks: 10 Russians, posing as Americans for at least the last 10 years, were charged with crimes associated with all manner of schmoozing, social-climbing, and trying to infiltrate American think-tanks, but not the big E: Espionage.

For many press outlets it was a chance to display their surprise that shortwave radio is used for anything other than Christian salvation, despite the fact that the very same publications ran nearly identical stories just a few years ago about an elderly couple found to be spying for Cuba. Publications from all over let readers in on the secret of the existence of spy numbers stations, including the damning fact that the spies had shortwave radios in their homes! Here's just a sample from the learned press:

Notorious HF Spy Frequency

Slate: The accused, "…used shortwave radio, a 1920s-era technology…"

New Scientist: Quoting a UK-based monitor of Russian spies in the 1960s, "There probably aren't all that many intercept stations listening for Morse traffic any more."

Christian Science Monitor: "Shortwave radio is similar to ham radio, and thus can transmit data as well as speech..."

Popular Mechanics: Featured a photo of an antique analog portable shortwave radio with the caption, "Shortwave radiograms are one old reliable spy technique that remains so."

And, finally, the inimitable *New York Post* couldn't get their editorial minds off the photogenic "Anna Chapman," dubbing the 28 year-old "Double-O-Heaven." Chapman apparently skipped the old-fogey Morse code course during her training and went straight to Facebook. While the whole lot was swapped for our own spies, no, make that "researchers," in a much publicized "secret" exchange, we probably haven't heard, or seen, the last of Ms. Chapman, whose own dad is a former KGB spook.

Radio Martí's Big Makeover

In an apparent response to a Senate report in June that scolded Radio Martí for its inability to hit their target market (the population of Cuba), the station and its TV counterpart have undertaken a web site and programming makeover. According to the Broadcasting Board of Governors (BBG), which oversees broadcasts on the two, the radio service has introduced a snappier sound and faster paced news presentation, while the TV service will air a "fresh line-up of news and features on economics, sport, health and technology." To aid in the effort, TV Martí will expand its programming on DirecTV satellite. But, will anybody on the homeland tune in? As a little insurance, BBG has launched an ad campaign in Miami to ask the Cuban exile community to tell their families back in Cuba to tune in.

Radio Martí (Courtesy: Broadcasting Board of Governors)

Vatican Radio Xmitters Linked to Cancers (Again)

Having powerful transmitters and large shortwave and AM antenna arrays situated in densely urban areas may cause an increase in risk of certain cancers to some of those living near such sites. That was the determination of a court-ordered report apparently leaked to *La Stampa*, an Italian newspaper, and picked up by many English news sources, including the *Vancouver Sun*. The report noted, "…an important, coherent and meaningful correlation between exposure to Vatican Radio's structures and the risk of leukemia and lymphoma in children."

Vatican Radio sticker (Courtesy: Shortwave Central)

The Vatican's *Catholic News Service* (CNS) was quick to report the issue and defended the use of such broadcast sites. CNS stated that the Holy See would soon have its own study out to refute the leaked report.

BBG Announces New Board

The Broadcasting Board of Governors (BBG), the group that oversees the running of U.S. international broadcasters, Voice of America, Radio Liberty, Radio Free Asia, Middle East Broadcasting Networks, as well as Radio and TV Martí, announced in a press release that eight people, appointed by President Obama, have been named to the board. The eight include Walter Isaacson, former CEO of CNN and former editor of *Time* magazine; Michael Lynton, chairman and CEO of Sony Pictures Entertainment; Dennis Mulhaupt, former VP at KCET, Los Angeles, and Dana Perino, former White House press secretary to former President George W. Bush. The BBG is an independent federal agency in charge of all U.S. government-supported, civilian international broadcasting. BBG claims their combined services reach 171 million people in 100 countries.

AM/FM/TV BROADCASTING

Ludwig's Ethnic Radio via HDTV

It's only taken a year, but one company finally figured out that the digital signals used to transmit HDTV over-the-air (OTA) can be used to transmit other digital services. The company, Florida-based Ludwig Enterprises, Inc. **(www.ludwigent.com**), says it developed and received a patent in 2009 for a new radio that receives programming via a portion of the digital transmission from an OTA TV station.

The plan is to provide 50 channels of a combination of ethnic talk radio, 24/7 news, old-time radio, religious programming, classical music and techno-rock. According to its home page, the terrestrially-based service will ask only a one-time subscription fee charged upon activation of the radio which is given to the user as a gift. The service plans no monthly fees but will rely on advertising inserted in its programming.

Ludwig's new radio. (Courtesy: Ludwig Enterprises, Inc.)

Heat is on for Dutch AM/FM Pirates

A report by Andy Sennitt on his Radio Netherlands Worldwide blog MediaNetwork (**http://blogs.rnw.nl/medianetwork**), the Radiocommunications Agency Netherlands, known by the Dutch acronym AT, is clamping down on unlicensed AM and FM operators in that country. The report quotes an AT official as saying they "…want to take preventative action, but if people break the law, we'll give the pirates tit for tat." Fines will start at €2,500 or roughly $3,188 and could be as high as $43,000.

PUBLIC SERVICE

Kansas Town Shuts Out Scanners

An article in the Garden City (Kansas) *Telegram* noted that city's transition from analog to digital and encrypted public safety radio. While law abiding citizens with analog scanners were immediately shut out when the city's public service agencies switched to a digital system, some bought more expensive digital scanners only to learn that the police had gone to encryption to further thwart interested citizens from overseeing the department's activities. A spokesperson for the police department claimed they had nothing to hide, but were just interested in officer safety.

Meanwhile, the local sheriff's department declined to use encryption, even though their units are interoperable with the city's police. According to the article, the Sheriff couldn't remember an instance in his previous 26 years of service "…when a citizen with a scanner created a safety issue." He noted that when it comes to classified issues in his department, investigators use department-issued cell phones.

SATELLITE

New DTH Satellite Service Offers VOD

XStreamHD is the name of new satellite TV service that offers video on demand (VOD) directly to homes via their own small-dish satellite TV system. The company signed an agreement with Lionsgate studios, a major Hollywood dream factory responsible for 20 current network and cable-TV shows, in addition to many blockbuster hit movies over the past decade. The company has leased transponder capacity on AMC-16 (85ºW) which itself is leased by Echostar, parent company of DISH Network.

XStreamHD satellite TV service receiver (Courtesy: XStreamHD)

Long-time industry watchers will remember Voom, a similar stand-alone service which pioneered HDTV via satellite using its own stand-alone small-dish satellite TV systems. That service went bankrupt, and the remains were later bought outright by DISH Network. At press time the service was slated to cost $300 for equipment and a $9.95/month fee in addition to rental fees charged on new movie releases. More details are at **www.xstreamhd.com**.

CCTV9 Now English News Channel

In an effort to blend more closely with other English language TV news channels such as BBC World TV, VOA-TV, Al Jazeera English, NHK, Deutsche Welle, Russia Today and Iran Press News channels, China Central Television's (CCTV) channel 9 has switched to an all-English news format. According to a press release from Xinhua, China's official news agency, the channel broadcasts in-depth reports, commentaries and documentaries with a particular emphasis on Asia. The channel is seen in 110 countries by more than 100 million people, according to the press release.

CCTV9 logo (Courtesy: China Central Television)

FCC ACTIONS

NOVs for QRM on Channel 16

The FCC issued two Notices of Violation (NOV) to the owners of two boats, one docked in South Carolina and one on a trailer on the owner's property in Oregon. Both apparently had faulty transmitters that were sending, unbeknownst to the owners, a continuous unmodulated carrier on marine VHF channel 16 (156.800 MHz), the maritime VHF international distress safety and calling frequency.

Another SF Pirate Busted

FCC agents operating in San Francisco, California sent a Notice of Unlicensed Operation (NOUO) to a man in that city operating an FM station from his residence at 102.5 MHz with a signal measured at more than 340,000 microvolts per meter at 264 meters (maximum allowable under Part 15 devices rules for unlicensed operation in the FM band is 250 microvolts/meter at 3 meters).

CONSUMER'S CORNER

Apple Stumbles with 4G Phone

With more than a million units sold in just the first few days, Apple's iPhone4 was one of the most successful high-tech product launches ever. But, there was a problem. Not that the phone was built with an anemic antenna, causing signal drop-outs, as proven in the laboratories of consumer watch dog Consumers Union, publishers of Consumer Reports magazine, but that Apple refused to acknowledge the issue in spite of the evidence.

The iconic master of Silicon Valley attempted to brush away such reports, insisting that the drop-outs were somehow connected to a software glitch and linked the problem to telco provider AT&T, the only company allowed to give service to the Apple iPhones. On their web site Consumer Reports stated, "We think it's the company's responsibility to provide the fix - at no extra cost to consumers." Finally, Apple blinked. While still not admitting there was a problem, Apple agreed to offer a free "bumper case" or selected other third party cases to customers who bought an iPhone4 before July 23, if they applied on line and did so before August 22. Other buyers must apply within 30 days of their purchase and you must buy your iPhone4 before September 30 when the deal runs out. Details are found here: **http://www.apple.com/iphone/case-program.**

Sony VAIO Computers Recalled

Sony, no stranger to product recalls, has issued a recall through the U.S. Consumer Product Safety Commission (CPSC) on 233,000 VAIO laptop computers, regarding a problem with overheating, "posing a burn hazard to the consumer." According to CPSC, Sony received 30 such reports of overheating which resulted in deformed keyboards and casings.

Involved in the recall are the VPCF-11 Series and VPCCW2 Series notebook computers sold between January 2010 and April 2010. More information can be found by calling Sony's toll-free hotline 866-296-7669.

Court to FCC: OTA Swearing OK… Sometimes

For the second time this year the courts have taken a whack at FCC rules. This time the court found the Commission had overreached its authority regarding fines imposed on over-the-air broadcasters for so-called fleeting expletives during live performances. A three-judge federal appeals panel ruled that the strict standards imposed during the previous administration and instituted in 2004 were, according to an article in the *Washington Post*, "unconstitutionally vague, creating a chilling effect that goes far beyond the fleeting expletives at issue here."

The ruling, however, was itself vague. Broadcasters were left unsure how to approach the ruling, parent groups and other organizations were dissatisafied with the ruling, and the FCC, which claims a backlog of broadcast indecency reports, was still undecided as to whether or not to appeal or how to rule on the backlog.

CELL FONE FOLLIES

Newbies Caught by Lost Phone

A group of teen-aged burglars allegedly ransacked a home in the Farmington, Connecticut area, but left behind one of their cell phones. When investigating police discovered the phone belonged to one of the perpetrators, the others were quickly implicated and arrested.

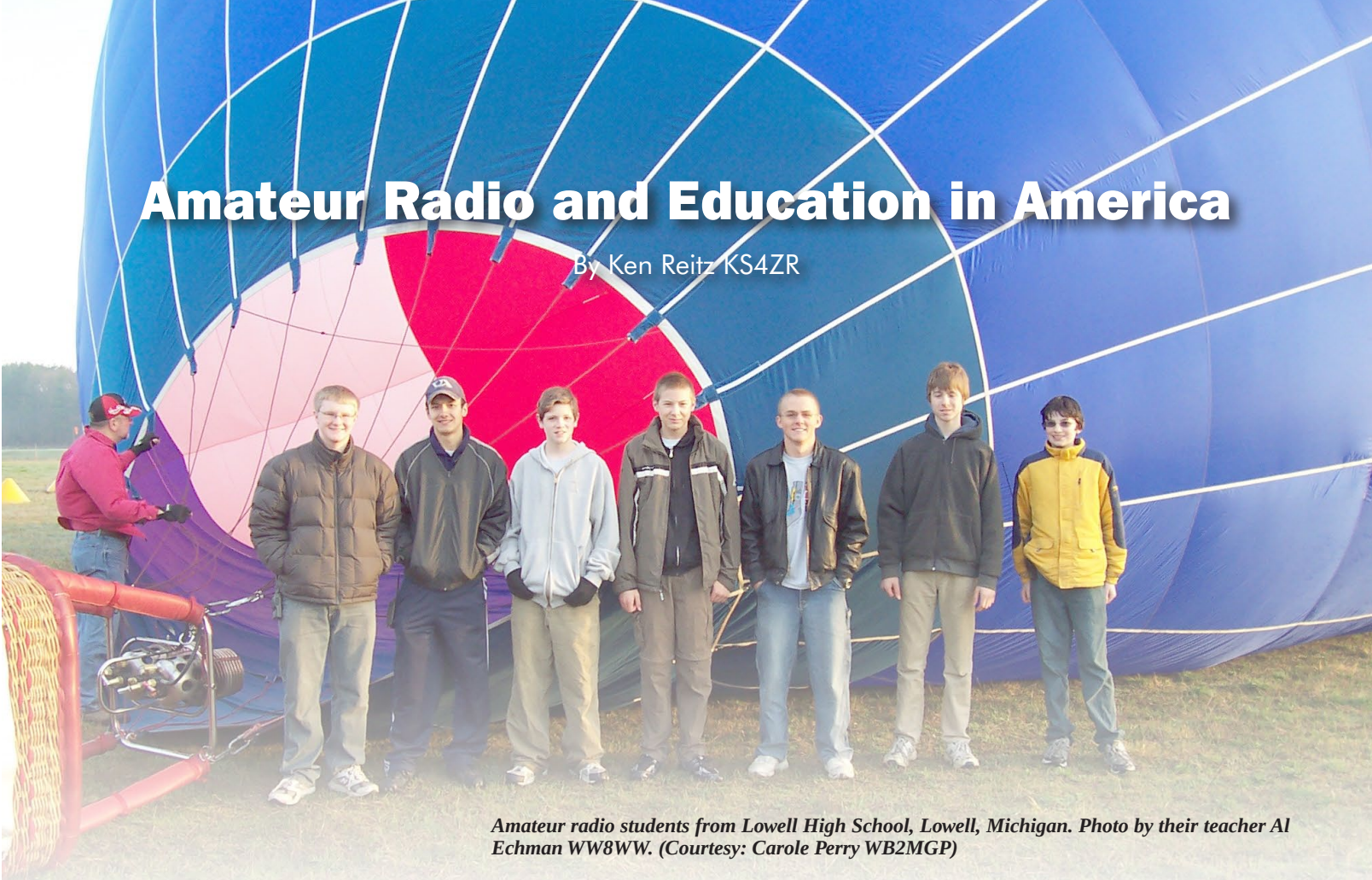
Stylin' Limo Thieves Caught

The owner of a D.C.-area limousine service uses a special web-based GPS tracking system to keep track of the limousines in its service. He noticed that one of the limos, which should have been standing by for later use, was actually on the move and had been for nearly 12 hours. Logging on to the web service and alerting area police to the apparent theft, the limo was recovered just as two joy-riders fled the cushy car's plush interior. One alleged limo thief was caught; the other made good his escape ignominiously on foot.

"Communications" is compiled by Ken Reitz KS4ZR (kenreitz@monitoringtimes.com) *from news clippings and links supplied by our readers. Many thanks for this month's fine reporters: Anonymous, Rachel Baughn, Douglas Robertson, Larry Van Horn*

Amateur Radio and Education in America

By Ken Reitz KS4ZR



Amateur radio students from Lowell High School, Lowell, Michigan. Photo by their teacher Al Echman WW8WW. (Courtesy: Carole Perry WB2MGP)

As students of all ages make their way, if somewhat reluctantly, back to school, it's a good time to assess the role of education in the future of radio. It's a become a cliché that children are our most precious resource, but when it comes to amateur radio and monitoring in general, it's totally true. Unless adults infuse the next generation with the same love of the mystery and magic of radio that we all grew up with, the future for our hobby is bleak indeed.

And, things couldn't have looked worse 10 or 15 years ago. The average age, as reported by the ARRL, of the average amateur radio operator was 55 and rising. It had been an unwinnable war of attrition, as an aging membership slowly declined in numbers.

Then, with the revamping of amateur rules, dropping the Morse code requirement, reworking the band plans, consolidating license classes, and the development of the League's Big Project, now called the Education & Technology Program (ETP), the number of licensed hams has risen year after year. Finally, this year the average age has started to decline. A herculean effort, backed by large donations from committed hams and other organizations, worked to make the relevance of radio part of the curriculum or at least part of the extracurricular activities at many schools. The results are truly impressive.

The latest figures show that over 450 teachers and schools nationwide are participating in ARRL's ETP. A complete list of those schools is found here: **www.arrl.org/etp-schools**. But, that list does not come near to showing the whole picture; there is an even greater number of elementary, middle school, high school, college, academy, technical schools and even post graduate schools not part of the ETP program that have established amateur radio clubs or have affiliated active radio clubs.

Nor does it list the private clubs such as Boys and Girls Clubs that have similar programs, or local amateur radio clubs that also sponsor young people's radio activities in their locality, or the many home-schooled children who operate almost daily.

Teachers Go Back to School

The League's ETP is the biggest and most active of the in-school radio programs and what they're doing is quite impressive. They offer a "Teacher's Institute for Wireless Technology" which applicants may attend virtually cost free. Paid for by generous donations from League foundations, teachers from all over the U.S. attend a four day institute and learn first-hand about the science of wireless technology including electronics basics, soldering, building a modem board, wave propagation, digital signal processing fundamentals, ham radio basics, building a microcontroller, robot construction and control, and much more.

Teacher graduates of the program come away with not just the knowledge gained during the institute, but an understanding of how to integrate that learning into their own classroom studies. They are also eligible for grants that let them take with them the radio equipment necessary to start their own amateur radio station.

It's an extraordinary opportunity for teachers in all fields. There is no requirement for teachers to have an amateur radio license in order to apply for or complete the institute. Several institutes are offered each year, to find out when and how to apply go here: **www.arrl.org/teachers-institute-on-wireless-technology**. The institute even qualifies as three college credits for teachers' continuing education programs.

If you're not a teacher, but you or your local radio club wants to start a radio club at a school near you, the League has a well produced guideline about speaking to youth groups about amateur radio. You can see a copy of it here: **www.arrl.org/files/file/1905Talking%20PointsYouth.pdf**.

Radio Club of America's School Program

Another organization that has been successful at bringing in young hams is the Radio Club of America (RCA), a profile of which was run in last month's *MT* written by long-time amateur radio educator, Carole Perry WB2MGP. Carole was lucky enough to spend thirty years teaching amateur radio in the New York City public school system (she wrote about her experiences for our First Person Radio series which appeared in the December 2009 issue of *MT*). She also chairs the Education Committee for the RCA and hosts the

Youth Forum at the annual Dayton Hamvention®, which is co-sponsored by the RCA.

This past May she presented nine young hams at the Youth Forum, all of whom received a $100 stipend from the RCA. Funds for these stipends come from a special scholarship fund, set up for that purpose, according to Carole Perry. And, she reports that many of the previous presenters have stayed in touch with her over the years. These young hams are recommended to the RCA Education Committee by friends, teachers, or other RCA members.

The RCA also has a program for schools that can receive up to $500 in grants from the RCA. The club also accepts donated amateur radio gear and has a facility that collects and inspects the gear, making repairs if necessary. They then ship the equipment to schools that have made requests for radio support. The club also accepts monetary donations which qualify for tax deductions.

To make sure your donation goes directly to the work of the Education Committee, be sure to contact Carole directly via email at *wb2mgp@gmail.com*.

School Club Roundup

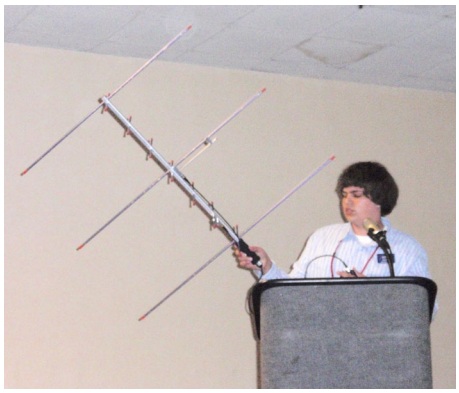
One of the highlights of the school calendar year for many school-age hams is the twice-yearly School Club Roundup (SCR). The contest runs from October 18-22 this year, with a second semester contest the second week of February. The objective is to contact as many school radio clubs as you can. School clubs from all over the U.S. participate and individual operators, not affiliated with any school, may also participate. Awards are given at the end of the contest, based on a points system, for schools, non-school clubs and individuals.

Even thought the contest lasts five days, it's not easy. The difficulty is that most school clubs operate only limited hours during the school day with some operating after school as well. Still, if you work the propagation and the time differences right, you can log quite a few stations throughout the early evening hours each day. Look for international participants as well. In addition to the U.S., I've worked a number of Canadian schools and even European schools during previous SCRs.

There is a set of frequencies agreed upon for SCR (see chart); however, when the bands, particularly 20 meters, are congested, you'll find many clubs operating outside these guidelines, so tune up and down from the suggested frequencies. Almost all participants will be students with teachers playing a minimal role in the background. You'll hear some very young voices and you may be pleasantly surprised at the confident sound of some of the seasoned SCR operators. Others are having their first on-air experiences and you'll need to be patient as they learn the ropes of the ham QSO.

One thing that has always amazed me is how little grief these operators get from crusty old hams who usually get quite annoyed at any disruption to "their" frequency and schedules. Everyone, even on 20 meters, cuts these youngsters a lot of slack and that's the true ham spirit.

Full details concerning SCR, including directions for sending in logs, are found on the ARRL web site: **www.arrl.org/school-club-roundup-1**. Forms for the SCR logs are found here: **http://home.earthlink.net/~scr-log**.



Sixteen year-old Andrew Koenig KE5GDB at the Dayton Youth Forum, co-sponsored by RCA. His topic was "Youth and Amateur Radio Satellites." (Courtesy: Carole Perry WB2MGP)

Radio Scholarships

Among the thousands of amateur radio clubs, societies and the ARRL, hundreds of thousands of dollars are given away to young hams every year. The biggest such source for scholarships is the ARRL Foundation, a 501c(3) non-profit organization separate from the ARRL. The Foundation administers some 53 scholarships each year ranging from $500 to as much as $10,000. One Foundation scholarship awards five $2,000 scholarships.

Many awards are given in the name of a ham whose generous gift made the scholarship possible; others are given in the name of the club or society from which the scholarship originates. In all, more than $80,000 in scholarship funds are awarded to young hams through the ARRL Foundation each year. Details on League Foundation scholarships can be found here: **www.arrlf.org/programs/scholarships**.

Another source of scholarships is the Foundation for Amateur Radio (FAR), which is a coalition of some fifty amateur radio organizations in Washington, D.C., Virginia, Maryland, Pennsylvania and West Virginia that administers 48 amateur radio scholarships. These post-high school scholarships range from $500 to $5,000 and are open to all licensed amateur radio operators worldwide who are pursuing a full-time course of study at an accredited university, college or technical school. For full details on how your young scholar can apply, visit their web site at **www.farweb.com**.

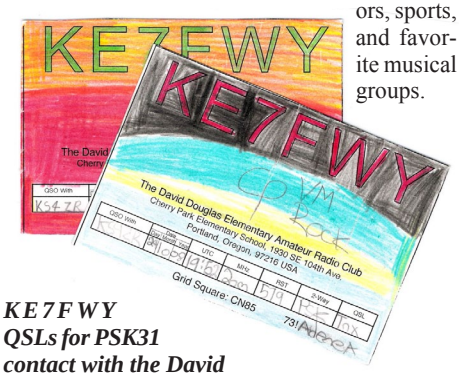
If you have a youngster in your family who is planning to go to college, this is about the best reason in the world to urge that person to earn his or her license. It's a win-win proposition. Your student gets a life-long introduction to amateur radio and you get a little relief from college tuition. Details on who qualifies for which scholarship are found at the web sites listed above. Some scholarships are reserved for residents of particular states, pursuing a particular degree, or other specifics. Learn which your student qualifies for and apply for as many as you can.

Giving Back

There are many ways you can give back to the hobby that's kept you entertained all these years. The easiest is to write a check to your local ham club scholarship fund or any of the other organizations named in this article. They are all worthwhile. Another way is to participate in or start a youth radio club in your locality. I've talked to many hams involved in such enterprises and, to a person, they have remarked at how rewarding it is.

And, if you're like most hams you have more equipment in your shack than you can possibly use. Even if it's old gear, it's new to a youngster. Consider sending it off to the RCA or ARRL programs and don't forget to take a tax deduction!

Finally, each year I try to work at least one of the School Club Roundups. One great aspect of the contest is that, unlike most contests, it's not a "5-9 QRZ" exchange. Instead, you're likely to end up talking to an entire class of kids who may have never heard about ham radio before and you could spend as much as half an hour on one contact. And, with some as young as six or seven years old, you'll have to switch gears and talk about something they're interested in like colors, sports, and favorite musical groups.



KE7FWY QSLs for PSK31 contact with the David Douglas Elementary Amateur Radio Club at Cherry Park Elementary School, Portland, Oregon during School Club Roundup. Students personalize QSLs for their own contacts. (Courtesy: Author)

Still, you'll be surprised at how savvy the kids are regarding this technology. I've had PSK31 QSOs with elementary school kids that amazed me. One sideband QSO during SCR was with a youngster at a high school on the Gulf coast of Mississippi that had been hit hard by Katrina. When I told him I was in Virginia he told me that he and his family had been relocated to Virginia for that year in the aftermath of the hurricane. He said that he was thrilled to see snow for the first time in his life and he would never forget it. Well, I never forgot that QSO, either.

SUGGESTED FREQUENCIES FOR SCR

160 meters: 1800-1810 kHz (CW) 1855-1865 kHz (SSB)
80 meters: 3530-3540 kHz (CW) 3850-3880 kHz (SSB)
40 meters: 7030-7040 kHz (CW) 7225-7255 kHz (SSB)
20 meters: 14030-14040 kHz (CW) 14250-14280 (SSB)
15 meters: 21130-21140 (CW) 21300-21330 (SSB)
10 meters: 28130-28140 (CW) 28440-28460 (SSB)
Digital modes: Many schools from elementary through college operate digital modes, mostly on 20 meters: 14070 kHz (PSK31) and 14080-14090 (RTTY)

The LBJ High School Experience

By Ronny Risinger KC5EES

I am a social studies teacher in a magnet program for gifted and talented students in Austin, Texas. The magnet program is called the Liberal Arts & Science Academy (LASA) and it is located on the campus of LBJ High School. In 2006, LASA was chartered as its own high school, co-located on the LBJ campus.

In the fall of 2003, while teaching geography, a student who knew my background in amateur radio (he saw my license plate), asked me about forming a ham radio club. It all began with a few small group discussions and the searching of closets around the school for radio equipment from a prior club that existed in the 1990s. With the discovery of an Icom 751a and a Ham Stick antenna, the club made its first contact on 17 meters with battery power from a desk set up in front of the school. After this contact, the group decided to become official.

After that, the LBJ High School Amateur Radio Club was officially formed and a club call sign was sought. Originally issued KE5BBZ, the group decided to opt for a vanity call recognizing our high school and later received the K5LBJ call. Even with LASA now being its own school, we will keep our uniquely Texan call. Since K5LBJ's inception, amateur radio has now become an elective course within LASA. This allows a steady flow of students that are exposed to amateur radio and electronics.

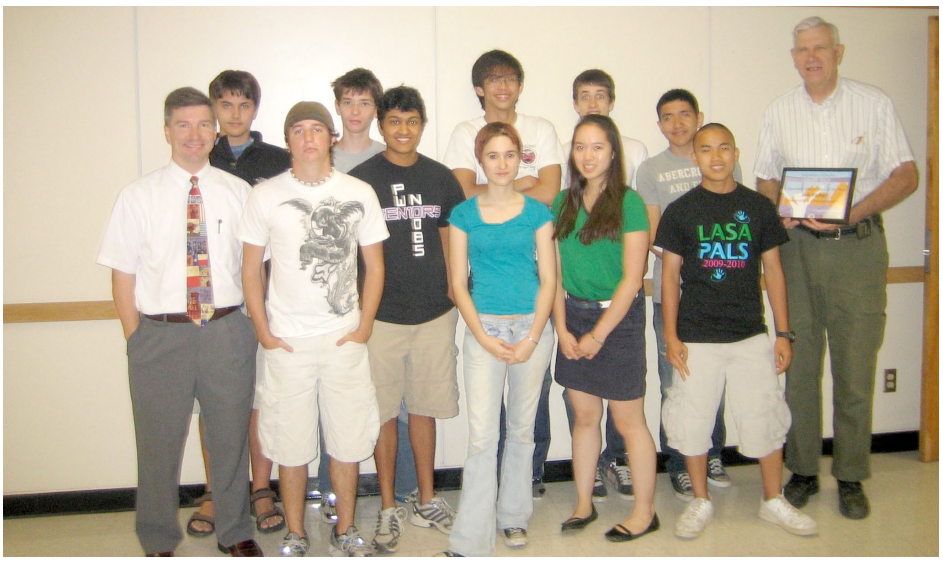
In any given semester, about 20 students are involved with K5LBJ. As far as licensing, it is encouraged, but not required. In the past, I have arranged for a VE session at the school and when I did this, licensing approached 80-90%. But without the VE session on campus, I now see students get their license about 10% of the time.

In discussing student interest and licensing with my Elmer and K5LBJ Assistant, Joe Fisher K5EJL, we have decided that about 10% of the students in any given program will ultimately continue their interest. In this day of technology overload, teachers should not get discouraged if only a handful of students show a real interest in radio. Having a few really good hams is much better than a lot of licensed, inactive ones.

Students love contests, and as such, competing in the School Club Roundup (SCR) in October and February always attracts student interest. I've found that if they like the contests, they are more likely to stay involved in the club.

Starting Your Own School Club

If someone is interested in bringing amateur radio into a school, they must first have the full support of the principal and have a teacher willing to sponsor the club. Ideally, this teacher would be interested in ham radio and be willing to get their license. Without the principal's support, it is almost impossible to get permission to install antennas or procure a place from which to operate. And, without the teacher as an "insider" to serve as a conduit between school and outside groups, such as local ham clubs, those wishing to assist inside the school may get lost in a maze of bureaucracy.



Students from Ronny Risinger KC5EES's, Amateur Radio elective course at the Liberal Arts & Science Academy High School. Joe Fisher, K5EJL, is holding his certificate for being the Classroom Volunteer of the year. (Courtesy: Ronny Risinger KC5EES)

If the teacher is not knowledgeable in operating radio, especially HF and CW, it is imperative that those wanting to form the club provide operators willing to supervise students so that they can operate. While it might be difficult to be "picky," this control operator/supervisor should have some skills at interacting with children at the given age level. If that person is the "poster-child" ham with no people skills (e.g. not patient with students who talk quietly or engage in some inappropriate behavior), is cold or too stern with the students, kids will lose interest.

One way to slowly get into the school is to offer to sponsor a School Club Roundup (SCR) group. The SCR is a school contest held each October/February where schools try to make as many contacts in a week as possible (bonus points for contacting other schools). By setting up a radio station at the school and demonstrating its utility and fun to the teachers and administrators, those wishing to get a ham radio club inside the school can gain a lot of goodwill with little investment in time or money.

Those who are involved in ham radio via K5LBJ are exposed to the full variety of amateur radio opportunities. We discuss emergency response capability, practice world citizenship via HF/CW communication, link radio's past to its present via digital modes (PSK31), and engage in homebrew construction.

Of course, in learning about radio, we also learn about electronics. For most, the radio course is the first time they have ever constructed an actual circuit on a breadboard. When a student constructs a circuit from a diagram, it empowers them. Engineering becomes real and tangible.

When discussing magnetic induction, we drop a magnet through a copper pipe. If you have never done this, you should. Watching the magnet fall will inspire any student to wonder about a career in physics.

Of course, by getting their license, students are then able to apply for ham-related scholarships. While the amounts are not always large, they can support a student in seeking further education, hopefully in a science or engineering field.

FOR YOUR EYES ONLY: Monitoring Secrets of the DX Pros

By Hugh Stegman NV6H and Larry Van Horn N5FPW

Editor's note: Last September a reader suggested that we have a feature article that detailed the listening habits and equipment of professional radio monitors. Two of our columnists stepped forward to let us peer over their shoulders in their listening posts. Hugh Stegman NV6H, who writes the Utility World column each month in MT and Larry Van Horn, former Utility World columnist, now Assistant Editor and Milcom columnist, tell us how it's done, but be warned: It's not easy.

HUGH STEGMAN WRITES:

My major "secret" to finding utilities is to let other people discover them. This means subscribing to a lot of Internet mailing lists and spending hours setting up ways to route the resulting hundreds of e-mail messages to appropriate folders where they can be read as threads. If this sounds time-consuming, and often headache-inducing, you are right on both counts.

Anonymity is often essential. Utility signal reporting is downright illegal in some countries. In others, it's a great way to get on all the wrong government lists. Even in the United States, large corporations have managed to get parts of the spectrum protected, which is why some of the best equipment isn't available here. Therefore, a lot of the time my sources have to stay completely off the record, or remain hidden behind Internet user names. After a while, one learns who has the training and the experience to be taken seriously.

The Listening Post

After this, it's all about listening, and listening deeper, and then listening some more. The real ace DXers can find signals using any equipment, from tinny little portables to full surveillance-grade setups with acres of antennas. They know that utilities come in layers, and below the loud stuff one often finds the good stuff. But, the best signal processor is still the human brain, though the "wetware" gets better with practice. The noise should not be a deterrent, as often there is good stuff in there below it. It's about hearing everything.

Equipment, however, does help. I've had some great setups over the years, but now I live in a noisy city that requires some sacrifices. My current main receiver is a JRC NRD-545. It's not made any more, unfortunately, because it's ideal for utility monitoring and it interfaces with computers well. Used ones hold up well, but watch out for bad trimmer capacitors.

JRC NRD-545 HF receiver (discontinued model) (Courtesy: Universal Radio)

A lot of the most advanced people are getting into the new software-defined radios such as the Pegasus and the SDR-IQ. These have some nice features for utility hunting, such as the ability to record whole swaths of HF to a computer disk, for analysis when you're awake. I have definite plans in this direction, once I work out logistics of how to get things connected up and in the best places.

I am still kind of old-school on antennas, preferring the longest and highest wires available. My feeling is that you can electrically shorten an antenna, but you can't shorten a 100-foot wave length. Currently I use mostly the PAR end-fed SWL antenna, which has been up for several years and still works great. It's around 50 feet long, and fits our lot just perfectly.

PAR End Fedz SWL antenna ($75) (Courtesy: Grove Enterprises)

The future, however, is a noisy one, as poorly-designed consumer gadgets take over the world. The antenna issue may be changing from acquiring maximum signal to achieving minimum noise. I have noticed that some people are getting good results with amplified loop antennas that pick up only one of a radio wave's two fields. This is another thing I plan to check out, when time and money are available.

Stalk Game Where it Goes

After all this, the secret is to be a good hunter. You stalk game where it goes, not where you'd like to be. If your body must sleep, a radio timer and a simple old voice-activated tape machine can catch a schedule. So can a computer with a big hard disk and suitable recording software.

I have found computer spectrogram programs like Argo (**www.sdrham.com/argo/index.html**) and Spectrum Lab (**www.qsl.net/dl4yhf/spectra1.html**), both of which are free, to be valuable aids in finding some really hidden beacons and narrow-band signals. Both can analyze narrow bands of only a few hundred Hertz, distinguishing non-random signals from random atmospheric noise. They're especially good for Morse code and digital modes.

It's good to have some familiarity with radio propagation, and especially the sudden fade-ins and fade-outs that can cause a DX catch on a band that everyone else has given up for dead. Sometimes computer programs can help predict these. Sometimes it's only experience, or plain old luck.

The best example of this sort of thing came when I was trolling for maritime coastal stations, hoping to get some in the log before they all closed down. In faded Norddeich Radio, Germany, with their distinctive tick-tock marker, on a frequency which no one ever heard in California. Fortunately, I had a cassette tape rolling at the time, and the recording is now on my web site **(http://mt-utility.blogspot.com)**. The signal was perfectly loud and clear, for maybe 30 seconds, and was never heard again. Soon after, the station left the air.

At the bottom of a previous sunspot cycle, I decided to troll the band between 6500 and 7000 kHz nightly and write everything down as an exercise in deep intercept. I used an old Drake R-4B, which I picked up at an astoundingly low price and still have. It's one of the

quietest and most listenable receivers ever made, though bands outside the old amateur allocation have to be added with extra crystals. There was no computer in the room. I wanted to get all the way down.

Late at night (local time), the results were incredible. There's still a lot of old HF gear being used in Asiatic Russia, and I was hearing railroad stations, phone patches from vodka-laden trawler crews, and fighting couples galore. None of the frequencies were even close to anything they tell you about in the books. Nowadays, I suspect the same effort would turn up literally hundreds of unlicensed stations in Indonesia.

The best catches, though, are the ones you can't talk about. These often require some radical thinking "outside the box." Some of the wildest stuff was actually heard during the last solar peak, on an ancient Bearcat 250 scanner, connected to a large inverted V antenna used for ham transmitting. I'm sure the static hastened this already-tired radio's demise, but the results (between image signals and overload) were staggering.

During one solar flare, Australian television was received in California. More routine were all manner of covert transmitters in Central America and the Caribbean, used by many of the illegal or intelligence-related activities that make the news when they're caught or something blows up. It went all the way from horse racing calls to deep-cover military espionage, in English and Spanish. Scary!

The point is that the ionosphere seldom behaves as neatly and predictably as we think it does, and that's when this hobby gets really interesting. Also, when the sun really gets going, there's nothing magic about the 30-megahertz number for serious DX.

LARRY VAN HORN WRITES:

You have to spend a lot of time, whether you're at your scanner or receiver, just listening. There's no magic here; the first good rule of thumb to becoming a good monitor is to listen for content. Whatever monitoring niche you choose, first find out what these guys are talking about. Know the on-air lingo; it will tell you what's happening when something out of the ordinary occurs. Do your homework.

Second, Google is your friend. Learn how to use that search engine and the power that it has. You would be amazed at what you can find online, whether you're talking about the HF spectrum or something as simple as running a call sign. A basic search can return a treasure trove of information.

Do the same with frequencies and be amazed at what you'll find. There's stuff all over here, but remember, not everything you see will be correct. Information may be old or, in the case of many chat rooms and forums, simply wrong.

You might spend days tuning around the HF spectrum and not run into much of anything. To get started fast, join the Utility DX Forum (**http://groups.yahoo.com/group/udxf**) and learn what other people are listening to. That's the best way to start: learn from other people's logs. I wrote *Utility World* for 10 years in *MT* and even now, every issue that comes out, I sit down and peruse Hugh's logs in *Utility World* to see if there are any little tidbits that I need to know about.

I keep notes and I have several substantial databases that I've accumulated over the years. Frequencies are everything in this business. You can have the best radio in the world, but if you don't have a frequency database to start with, you won't know where to begin.

The Gear is the Key

Naturally, if all you're trying to hear is a 250-500 kW transmitter from an international shortwave broadcaster, you won't need much of a radio. It will be harder to hear the 1 kW transmitters, but when listening to HF utility stations, the radio is going to make all the difference. Most utility transmitters are considerably less than 10 kW. What's the power of an HF transmitter on the flight deck of an airliner? A couple hundred watts at best, so if you're in your listening post using the lowest-end portable with a whip antenna and wondering why you can't hear them, you need a major station upgrade. The more receiver and antenna that you have, the more you're going to hear.

For serious utility monitoring you need a substantial antenna. Stay away from amplified whip antennas: you're just amplifying the noise, because you're not going to get enough signal from those low power utility transmitters to hear properly. Noise is an issue on HF, and only a better antenna will bring in more signal and less noise. I've got a 300' long wire out here oriented for a certain area that lets me hear things that I wouldn't hear otherwise. And, I've got two G5RVs that are at right angles to each other so that I can monitor the HF bands from any direction.

G5RV (Courtesy: Universal Radio)

I've been fortunate to have access to the best monitoring radios made today. Those include the Perseus, Flex-3000, WinRadio Excalibur and AOR radios. This is the future of radio and it takes a little getting used to, not being able to just reach up there turn a knob. But, once you get over that, all I can say about those radios is, "Wow!"

To be able to look at a spectrum display for a chunk of spectrum is extremely interesting. You can literally see things that you may not have been able to hear at first pass through the bands. Now you know what to listen for, where, and, with a little analysis, you can determine the type of signal it is, who it belongs to, and whether or not it's encrypted.

FLEX-3000 Software Defined Radio ($1,600) (Courtesy: Flex-Radio)

I wish I had a nickel for every time I've heard somebody say that shortwave is dead or that this hobby is dying. Nothing could be further from the truth. I see old-timers that are not keeping up with the hobby. Sure, there are things in the spectrum that you are just not going to have access to. But, there's so much up there still. How do we know what's there? Because we're using a digital decoder program, PC-ALE, to identify who's on a given frequency.

If I had to give out an award for the technologic advancement of this hobby of all time, beside PSK31, it would go to Charles Brain, the guy who invented PC-ALE decoder software. It's a killer! It took monitors into a whole new age and showed us that in the HF spectrum there's a lot more to listen to than any of us imagined. HF/VHF and UHF aren't dead, they just moved to different modes.

It's a fact of life that technology is going to march on and they're going to make more efficient use of the spectrum and that's what we're seeing them move to.

So, put up a nice long shortwave antenna like the G5RV ($45.95), a good omni-directional VHF/UHF antenna – I'm using the Scantenna ($49.95) from Grove Enterprises – and you'll be amazed as your receiver comes to life.

Help from Readers

As the *Milcom* columnist, reports from *MT* readers are also important, especially for something like our annual air show guide. I cannot go to every air show in this country and I've found that sometimes what people are hearing on the West Coast is different from what we might be hearing on the East Coast. And, with VHF/UHF frequencies, because of the nature of those transmissions, it's super critical to hear what readers are monitoring in their own areas.

It also lets us confirm patterns of frequency use, when we can collect such data from around the country, particularly with regard to monitoring military or other federal agencies. For example, when the Department of Defense decided that they wanted to create their new land-mobile radio sub-band in the 380-400 MHz area, the reports from around the country are what helped us – without any inside information – put things together to make some logical assumptions about what each particular frequency was being used for.

It takes a lot of time and a lot of people in order to do something like that. You folks are a crucial resource.

MT

DXing the Medium Waves with a DIY Loop

By Dave Schmarder, N2DS
(All graphics courtesy the author)

Loop antennas have been the mainstay of the broadcast DX community for nearly as long as radio has existed. Loops were a military and scientific curiosity going back to World War One when Major Edwin Armstrong used loops to pick up weak enemy transmissions using a very sensitive super-heterodyne receiver. Today, loops are every bit as useful and should be an integral part of your listening post.

Loops of the Past

Beginning in the early 1920s, loops were commonly used with broadcast receivers, particularly the early "portable" sets, such as the DeForest D-10 receiver. Manufacturers climbed aboard by including loops with their home radios. Many of these loops were quite beautiful and, as representatives of the state of the radio art, were probably well accepted in the parlors of the day.

As radios became more powerful, it appears that the large loop antenna fell into disuse as outdoor wires, typically along the roof line, became the antenna of choice for the radio listener. Then, in the late 1930s the loop made a comeback. But, instead of the large external loop wound on a frame, the loop was included as part of the receiver. This loop replaced the small antenna tuning coil, so that the loops not only captured the signals but also tuned the radio input.

Through the rest of the tube era these built-in antennas were the rule. That old "All American Five" tube radio on the kitchen counter had one, and even today all modern radios have loops. You can demonstrate the loop effect by tuning a portable radio to a station and then rotating the radio. You'll hear a strong signal in two directions and a weak one in the other two directions.

Loop Theory and Operation

Loop antennas work on the basis of frequency resonance. If you place a coil connected to a capacitor in a field of energy at its resonant frequency, this energy will be absorbed in the circuit. The energy can then be sent to a radio receiver by placing a small wire coil in the energy field of the loop, and connecting the wire ends to the antenna input terminals.

This can be compared to blowing across a glass bottle. The wind provides the energy at many frequencies in the audio spectrum, but the bottle only responds to a single tone due to what's known as resonance excitation. This tone can be changed by altering the inside bottle dimensions, by adding water, for instance. Rotating a loop antenna determines how well the signal is received. The RF energy will add or cancel depending on the relationship of the wires to the signals hitting them.

Some of my earlier spiral loops attached to crystal sets.

Types of Loop Design

I've built loops with two winding shapes: spiral and box. The spiral loop has the winding starting on the outside, and as the coil is wound, the wire moves towards the center. This is the simplest loop to build, but I haven't found it the best. These loops are harder to tune with a single 365 picofarad (pF) variable capacitor. Generally, a higher capacitance value is needed to tune the entire 530-1700 kHz band. This is due to a higher self-capacitance of the loop, which I will discuss later in this article.

My favorite loop type is the "box style" winding. The windings form a box around the outside of the frame of the loop. A moderate size loop, such as described in this article, easily tunes the entire broadcast band with a single 365pF variable capacitor. I've also found that the directional characteristics of a box style loop are more pronounced than with a spiral loop.

Loop Advantages

Is loop amplification needed with these antennas? In most cases the answer is no. The loops that I build offer a fairly large capture area. The receiving antenna is large enough so the energy from the signal excites the antenna windings. At my location, I can hear all the way down to my noise floor. This noise is mostly natural atmospheric energy. Perhaps on a quiet, cold winter evening some additional amplification might be desired. Mostly, this will depend on the sensitivity of your receiver. To help increase signals, you can also increase the loop size which gives you more capture area.

The free lunch magic of a loop antenna is the ability to select stations by peaking the

Hi-Res picture of my large loop taken outside.

wanted and nulling the unwanted. This directional ability is very useful to the DXer as well as the casual listener.

As an example, I like to listen to WSM in Nashville from my location in western New York. The signal is usually good most evenings, but especially strong in the winter months. Unfortunately, a New York City station on the adjacent channel now uses Ibiquity's HD-Radio digital broadcast system known as In Band On Channel (IBOC). Since the IBOC-produced hash is actually on the adjacent frequency, this presents a problem that can't be cured with wave traps or receiver selectivity methods (with the possible exception of synchronous sideband selection methods). But with a loop, and the fact that these two stations are nearly 90 degrees apart at my location, I can still hear WSM with reduced interference most of the time.

This is an advantage to the AM DXer as well, by reducing strong adjacent signals that are not in line with the desired station.

Size Considerations

The next question is: How big can this antenna be? It can be as big as will fit where you want to use it. Remember, the larger the antenna, the larger the signal capture area. But, there is a hidden disadvantage of the large loop antenna. That is "distributed capacitance," also called "self-capacitance."

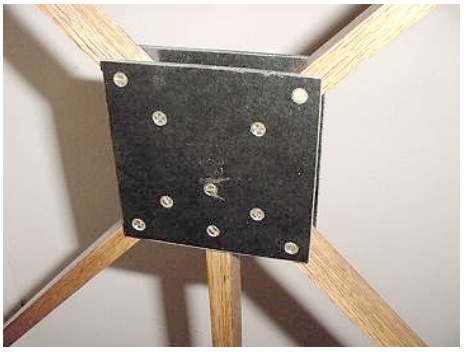
Here's the rule: The larger the diameter of a coil, the higher the distributed capacitance. Because all capacitance is factored into the resultant resonant frequency, a lower inductance coil is required if you still expect to be able to tune the top end of the band (1700 kHz). But then, to tune to the bottom of the band (530 kHz) with this lower inductance coil, more capacitance is needed. A parallel connected, double-gang 365pF capacitor will tune the whole band.

Building Your Own Loop

Here's the good news: The materials list is short and inexpensive for a DIY loop antenna. To build the 20 inch on a side, smaller loop shown, you will need about 110 feet of insulated wire. This can be any enameled or otherwise insulated wire. Any size is fine, just so the wire fits comfortably on the loop. But a very thin wire gauge might break if the loop fell over. A variable capacitor is needed. Since the loop is small, a single 365pF is used.

The arms and mast are made with three 1/2" thick by 3/4" wide pieces of wood. I used stained oak in my project. The mast is 19 inches long. The two arms are each 27 inches long. Each arm has a notch cut in the center that allows the two pieces of wood to interlock in the shape of an X shape. The ends of the arms each have a slit cut to accept the wire spreader pieces. Two sets of machine screws, washers and nuts are used to fasten each spreader to the arm ends.

The four spreaders are made of 1/16" thick Garolite ® that are each cut to 4" long and 1-1/2" wide. Using Garolite, sold by the



Detail of the center of the loop showing the square pieces screwed to the arms and mast.

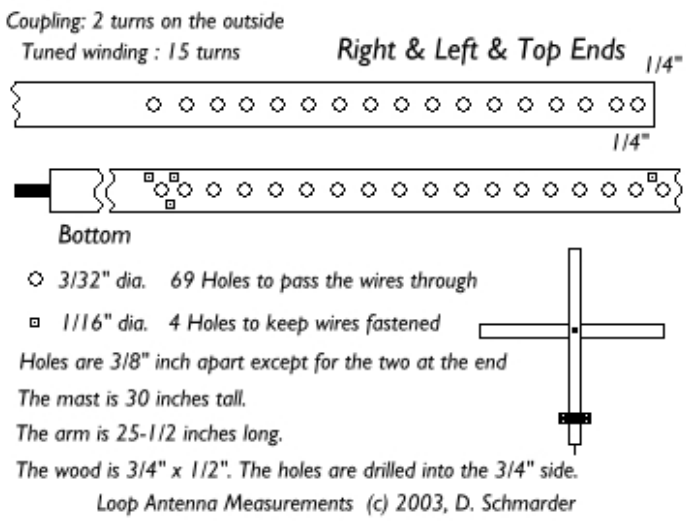
McMaster-Carr Co. is not necessary. Other plastics may be used. Along the long edge, 15 notches are cut. Each notch is large enough to accept the wire passing by and spaced at 1/4" intervals.

There are two more pieces of Garolite, each 4 x 4 x 1/8". They hold the center of the loop together. I used flat-head brass wood screws to secure them. The stained wood, Garolite and brass really give this loop a nice look!

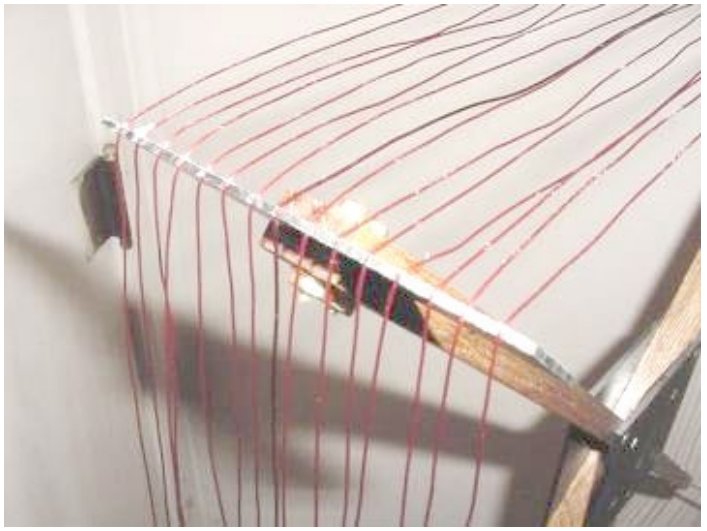
Next, the mast is prepared. I shaved the mast at the top, so it would fit closer to where the arm pieces cross. Several more wood screws were used to fasten the mast to the rest of the loop. The mast bottom has a 1/4" dowel placed in the end which is not glued in. If the unglued dowel breaks, it can be easily replaced. If you were to use 3/4 x 3/4" wood, a larger and more substantial dowel can be used. I mounted the variable capacitor and the two terminals to a piece of Garolite attached to the mast.

All two windings (four wires) terminate at the center of the loop. Each wire needs to pass through two small holes drilled in the mast, which hold the wires tight. These eight holes should be drilled several inches lower than where the windings cross the mast.

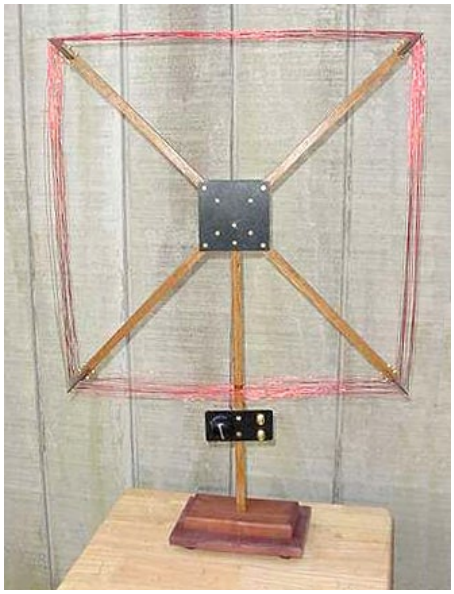
There are 14 complete windings for the tuned section and one for the pickup wire. Wind the 14 turns first; skip one notch in the center of the spreaders; then wind the single turn for the pick up around the notched wire spreaders, connecting the ends to the two terminals that



Hole spacing and number for spiral loop antenna.



Close-up view of the loop wires at the corner.



Main view of the small loop described in the article.

are next to the tuning capacitor.

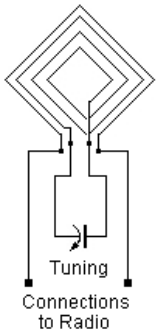
The last item on the parts list is a base for this loop. Make it large and heavy enough so your loop doesn't tip.

Loop Placement and Use

Your loop should be placed within reach while you are operating your radio. As you tune your radio, the capacitor on the loop must be adjusted for a peak in signal level. If you have an S-meter, this is even better, but peaking by ear works fine.

You will find this loop useful for about any medium wave radio, from the little transistor radio held near the loop, to the home stereo system and all the way up to the big communications receiver. A communications receiver will have antenna terminals already for your connection.

The connection to a home stereo might vary. Many come with a small, non resonant loop on a piece of plastic. If the plastic loop will reach, it can be placed near your newly made loop. Or you can disconnect that loop and run two wires from your pickup loop built in the loop to your AM receiver.



Schematic drawing of the loop connections.

If you are using an old style tube radio, be very careful about connecting internally to the radio. The transformer-less radios (called AC-DC radios) must not have connections to it made by you.

All in all, a loop will improve your reception, whether it is for catching rare DX or for casual listening to distant stations. When I use my loop, I can hear my favorite station from Toronto (CFZM-740) nearly anytime from western New York.

Shortwave Loops? Yes!

I have built loops for shortwave reception, but they are a lot different than my medium wave loop efforts. Here's a brief description. I wound one turn of RG58 coax around a hula hoop. In the middle (or at the top of the hoop), I separated the shield, drilled a hole through the hoop to force fit a 1/4" stereo phone plug through the bottom. The screw-on metal cover of the plug holds the plug on to the hoop. It seems flimsy, but it works!

Next, I drilled a hole in the top of a chassis box and put in the mating jack through the box. The variable tuning capacitor in placed inside the chassis. However, I found that an amplifier was needed and I used a simple, single transistor for this.

The loop worked great, especially on 160 meters. The higher in frequency, the less effective its directional properties became. But, it is a worthwhile project and should be pursued by the shortwave DXer.

How About Outdoor MW Loops?

It is certain that loop antennas work better outdoors than indoors. My own experiments with my crystal radio loop antennas proved that it worked better outside than inside. However, there are disadvantages with an outdoor loop.

Three considerations are: First, how will you turn and tune the loop? Turning is solved by using a small TV antenna rotor or other small motor even though the motor might take a long time to turn, perhaps up to a minute end to end.

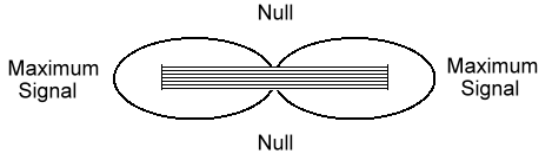
Second, is building a loop to withstand the weather. Connections must be made waterproof. Plastics that won't degrade in the cold weather or sunlight can replace the wood pieces.

And, finally, remote tuning can be done with a motorized variable capacitor. Limit switches will be needed unless the capacitor is one that has no stops. Vari-caps or varactors can also be used to electronically tune a loop. My experiments weren't that successful with electronic tuning, but maybe I gave up too soon.

Another Loop Example

The big loop shown was built in 1958 by my father. It was his first loop. It measures 33 inches on a side. The spreaders are 5-1/2 inches long and 2 inches wide. There are 8 turns of wire on this loop each spaced 1/2 inch from the next. In the middle there is a notch in between windings 4 and 5. This was the place that a single turn pickup wire was wound. The original design had a 365pF variable capacitor and a switch that would add an additional 250pF for tuning the low end of the band.

Several years ago I converted this loop so it would also be a crystal radio. I used a dual 365pF capacitor connected to a knob through a vernier reduction drive. The original 20 gauge wire was exchanged for large strand count litz wire. In the winter listening contest I heard 92 stations, but the rest of the time the loop is connected to my old-time Fairbanks-Morse 7 tube table radio.



Antenna pattern of a box wound loop antenna.

About the Author

Dave Schmarder was born in 1950. Before he started the second grade, the radio and electronics bug had bit. As a teen he followed his father and brother in to the amateur radio hobby. A few years later he earned his First Class Radiotelephone license. In 1977 Dave earned his Amateur Extra license and has held the N2DS call sign ever since.

After working for Corning Electronics Inc. selling electronic parts for 34 years, he retired. Dave now builds crystal radios and small tube radios and is the webmaster of the http://makearadio.com website. Here he enjoys helping others discover the wonderful hobby of homemade electronic projects.

NOTES AND LINKS:

McMaster-Carr **http://mcmaster.com**
Garolite is an electrical insulator made with paper and resin and is a trade name by McMaster-Carr.
Loops built by the author: **http://makearadio.com/loops/**

More AM DX Antennas

By Ken Reitz KS4ZR

Not everybody has the tools and the skills to build a loop antenna or the desk space on which to put one. Luckily, there are three ready-made AM loops on the market that can turn just about any AM radio into a DX machine. But, there is a caveat. The better the radio you start out with, the better the DX when you add any AM loop.

You can buy the loops mentioned here from several companies, including Radio Shack, which carries the Grundig model ($39.99) in their stores and online; C. Crane, which carries the Terk AM Advantage ($39.95); Grove Enterprises, which carries the Grundig loop ($29.95); Universal Radio, which carries the Select-A-Tenna 541-S ($179.95) as well as the Grundig and Terk loops; and Kaito U.S.A, which carries its own model ($29.95), that is identical to the Grundig and suspiciously similar to the Terk, directly on line at www.kaitousa.com/AN100.htm.

Select-A-Tenna (Courtesy: Universal Radio)

Ready-Made Loops

The Terk/Kaito/Grundig AM loop is essentially the same product, the most widely available, and the least expensive. But, don't let that put you off. These are very capable loop antennas. They are passive loops, without amplifiers, 9" in diameter, in a variety of mounts, they have a tuning capacitor built in, and come with a 3 foot cable to be connected to AM radios with external antenna jacks.

On reading reviews of these antennas by ordinary users, it's obvious that there is some misconception about their use. To use one, simply position the loop near the radio's built-in ferrite core antenna. Experimenting with placement of the loop will tell you where it works best. Turn the radio on, tune in a target station, and adjust the volume. To make the loop resonate on that particular frequency, slowly turn the tuning capacitor knob until the signal increases. By rotating the loop around the radio you may further increase or decrease the signal.

A huge advantage to these loops is that you can null out an adjacent signal that's interfering with the target station, just as with the DIY loops described in Dave Schmarder's accompanying article. You'll have to adjust the tuning capacitor each time you change frequencies on the radio.

Another advantage to the Terk/Kaito/Grundig loop is that it comes with a connecting cable that can be attached at the base of the loop on one end and any radio that has an AM antenna input. Most stereos have these inputs, but very few people have ever used them, and the pitiful loop antenna provided with even the most expensive stereo systems is not worth the landfill space it will eventually occupy.

Kaito AN100 (Courtesy: Kaito U.S.A.)

These loops works very well connected to such an input and allow you to set the antenna in a more convenient place. I keep the cable attached to the back of the stereo because it's a pain in the neck to get behind the stereo cabinet to connect and disconnect it, and I can still use the loop without the cable on other radios.

The more expensive Select-A-Tenna 541-S is an active loop which has a built-in regenerative amplifier powered by a 9 volt battery (not included); a ferrite probe connected by a cable to the loop which is placed near a radio's built in antenna; as well as a direct-connect cable that the user may extend to as much as 25 feet by adding a cable extender (also not supplied).

Full Wave Wire Antenna

Serious AM DXers with plenty of real estate use Beverage antennas. Dating from nearly 100 years ago and named for its inventor, Harold H. Beverage, this antenna works extremely well at AM frequencies. And, because it is a very low-noise antenna, it's favored by AM DX chasers as well as amateur radio operators working the 160 meter band. The Beverage is not used as a transmitting antenna. Instead, many hams use a separate vertical antenna for transmitting and switch between the two for transmit and receive. Effectiveness of the Beverage decreases as HF frequencies rise.

Grundig AM Loop (Courtesy: Grove Enterprises)

Terk AM Advantage (Courtesy: C. Crane)

The Beverage needs to be at least one wavelength long and laid out in the direction you want to receive. Distances at AM band frequencies are big. A full wavelength for 540 kHz, for instance, works out to about 1,824 feet, almost a third of a mile. Even the higher end of the AM band is a significant distance: about 616 feet.

If you lay your antenna on a line northeast and southwest, for example, it will receive stations best off either end. To make it receive only in one of those directions, a terminating resistor (2 watt 470-500 ohm) is placed between the wire and a ground rod on the end of the direction you want to hear. It's advisable to slope the end of the antenna toward the resistor and ground to further reduce noise.Regardless of which direction you lay the antenna, it need be no higher than 6 to 8 feet above ground. You will have to take into consideration whether or not people or animals (deer, for instance) will come into contact with the antenna, not because it is a radiator, but because it can be accidentally pulled to the ground.

Because of the design of this antenna, you'll need a 9:1 balun to make the wire match RG/6 or RG/8 coax feed line.

Some Beverage users advise that these antennas work best in multiples of wavelengths, but that's just about impossible for most hobbyists. A "shortened" Beverage (anything less than a full wave) is still a good performer and will amaze you with its reception capabilities. If you have a true abundance of room, Beverage antennas laid out in four directions and connected to a remote controlled antenna switch can give you the ultimate AM DX antenna.

An abundance of articles about Beverage designs and the experiences of many different people using such antennas may be found at **www.dxzone.com/catalog/Antennas/Beverage**. Additional articles, including interviews with Dr. Beverage, can also be found at **www.hard-core-dx.com/nordicdx/antenna/wire/beverage/index.html**

MT

My Half-Century in Radio

By Ron Walsh VE3GO
(all photos courtesy the author)

My first radio experience was listening to AM radio as a small child. I remember listening to NHL and local hockey games with my brother Bert on a small, brown, AM radio. The station was CKWS 960 kHz, near our home in Kingston, Ontario.

Dad used to tell me about building a tube radio when he was a youngster, and the first station he heard was WBZ, Boston. But, it was a crystal radio kit received for Christmas one year that started me on my radio career.

My dad was a land line telegrapher who could handle CW (Morse code) at well over 40 words per minute. Later he worked at James Richardson and Sons, Ltd., as a brokerage operator, where he copied the stock quotations off the telegraph, a job he actually held when the stock market crashed in 1929. Once, as a kid, seeing dad's sounder and key, I asked him if he would write out the Morse code so I could pretend to send real messages. This allowed me to copy slow code on the radio later on.

Dad had an aunt and uncle in Boston and we made several trips to visit them over the years. On one of these trips, my brother was given a National SW-57 shortwave radio which he kept in his room. Eventually, my brother went away to university and left the SW-57 at home. He said I could use it, so I took it to my room and connected it to the bed springs. The first station I heard was the time-signal from CHU Ottawa on 3330 kHz.

A great family friend, the late Charles A. "Chuck" Millar VE3GO, who had been an amateur since the 1930s and had worked at South East Shoals Lighthouse on Lake Erie, helped me connect the radio properly and showed me where to listen.

Later, I moved into my brother's room and connected to his wire antenna, and the radio world opened up. The BBC, Radio Brazzaville, HCJB and other broadcasters became my companions. I began to send SWL reports to *Popular Electronics* magazine; I still have a copy of the magazine that shows credit for my reports. I received and still display their registered SWL call VE3PE1BQ.

Not long after, a friend of my father's said he had a Hallicrafter S-38 he wanted to trade for some AM radios. A longer wire antenna and a small radio shack in the basement led to much better listening. I started monitoring the amateur bands as well and met some of the local amateurs. I wanted to get my license, but school, the sport of curling, being a race fan, and going to sports car rallies took up most of my time.

My Christmas present in 1963 was a surplus HRO receiver. It had 2.5 volt filament tubes and worked like a charm. George Kennedy, VE3GHK, the late Norm Berman, the late Ben Kendall, VE6FN, and I had a lot of fun with radios in many locations, during our high school years.

As a youngster along the docks

I distinctly remember that one day Radio Moscow said to stand by for an important announcement. They then announced the first man to orbit the earth. I knew about Yuri Gargarin before the rest of the country did, but it took a while to convince my dad of the news! Even now, most people do not know that Gargarin was an amateur.

I also had developed an interest in Great Lakes ships. My father managed a company that brought coal freighters into Kingston. We got many a call from the marine radio station at odd hours saying the ship was arriving. I had a trip on a freighter in 1958 with my parents and saw marine radio telephones for the first time.

In 1961, I got another trip, this time on an old coal freighter, and copied down all the radio frequencies they had in use. This was in the 2 MHz AM days.

I was actually allowed to use the radio to call in. It was then that my listening interests shifted to marine and utility radio. I remember doing my homework listening to VBH Kingston, WLC Rogers City, WMI Lorraine and all the famous marine stations. In the winter these stations would be off and the East Coast and Gulf stations would come in. I still have a letter from San Francisco Coast Guard confirming reception of them on 2670 kHz.

Starting a Career and Family

From 1965 to 1970, I attended Queen's University; Peterborough Teacher's College and still did a lot of listening. The lack of any factory summer jobs to finance my university courses led me to sell tickets for the local Thousand Island Tour Boat line where my first official radio calls were made on a Marconi Marcom 2 MHz marine radio telephone. I actually talked to VBH, which I had heard so many times.

I became a captain the next year and eventually worked off a Master Minor Waters certificate. Little did I know that I would do this for the next 40 years! I remember monitoring when the *Daniel J. Morrell* sank in Lake Huron. Emergency messages to her sister ship the *E. Y. Townsend* averted another tragedy. She was found to have cracks in her hull and would have suffered the same fate as the *Morrell*.

From 1970 until 1976, I started my teaching career, married my wife, Dawn, and our daughter Jennifer was born. When my summer courses for teaching were over, I decided it was time that I got my amateur radio license. My father had retired the previous year and became VE3BRK. His war-time training in the Signal Corps and his Morse ability were put to good use. I also got my first single lens reflex (SLR) camera and my photography of ships and race cars increased accordingly.

In 1976, the late Bill Bushell, VE3DXY and Bert Hovey, VE3EW, ran the radio courses for the Kingston Amateur Radio Club. This was the first year that the Department of Communications (DOC) was shifting from tube to solid state diagrams for the course. We had no book, but worked from the notes prepared by the instructors. They were going to use these to publish the first instructor's guides for the Canadian Amateur Radio Federation. Knowing Morse helped, and after about 6 months work, I passed my amateur exam and became VE3IDW.

At that time, you had to work Morse below 30 MHz for one year before trying for your advanced exam and getting phone privileges. My wife, Dawn, actually bought me my first HF rig, a Yaesu FT-101E. A Mosley vertical was ground

Shipboard with Mom 1958

2 MHz Marcom transceiver from the Lady Kingston

mounted and I was on the air.

After working a W5, my next contact was a CW contact with my father. I do not know which of us was more thrilled. It was just a couple years later when my brother became VE3KBW and the whole family was on the air. I worked a lot of CW in those days and it's a mode I still enjoy.

During this time, I went back on the tour boats during the summer and evenings. I had to renew my marine radio license and started using VHF marine radio. About one year later, I passed the advanced amateur radio course and got on SSB. I can still remember working my friend Keith Goobie when he was stationed in the Golan Heights as VO1LX/4U which counted as Syria.

I worked on public service events such as a local Olympic training regatta, Field Day, emergency training exercises and contests. My shack grew to include VHF rigs, a VHF mobile in the car, a general coverage receiver and a scanner. My FT101E was also modified by Don, VE3MNE, so I could transmit on 10 MHz CW when the WARC bands came in, and I still enjoy operating on this band. A portable scanner followed me to the race tracks and the ship channels.

Working with CARF

In the early 1980s I was contacted by Art Blick, VE3AHU, who asked if I would like to be involved with the Canadian Amateur Radio Federation, better known as CARF. Art was responsible for the Canadian military using amateur radio for phone patches from the Gaza strip in the 1950s, and he is now a member of the Canadian Amateur Radio Hall of Fame.

Art, along with Doug Burrill and Ken Rolison, had started CARF and were trying to build a Canadian amateur organization. Bill Wilson VE3NR, ex Director General of the Department of Communications, was our president and Art Stark VE3ZS was a trusted advisor. I learned a great deal from these gentlemen who have unfortunately all passed on.

Loading Steel

I started as assistant general manager in charge of membership at CARF, and it was my job to provide services so we could increase our membership. I worked out an affiliate club program allowing club stations to use our free outgoing QSL bureau.

It was fascinating seeing CARF grow. Our magazine, *The Canadian Amateur,* really matured during this time. Headquarters were here in Kingston and we even established an HQ amateur station VE3TCA (*T*he *C*anadian *A*mateur). A few years later, I was appointed a vice president by Don Slater.

We had a big problem with the amateur exams at that time. The questions were essay type and even electronics professors were failing. Art took some papers to the Royal Military College where he worked, and the staff said these people should have passed with flying colors.

I did some checking on the subjects being examined and found they were in second year university and third year community college texts. It was then that Art and I decided we needed to make a presentation to the DOC in Ottawa. We put together a well researched presentation and were invited to DOC headquarters – where I have to admit I was very nervous during that first trip.

When we got there, Art's voice gave out due to a cold, so it was up to me to make the presentation. My years in the classroom took over and I must have done a creditable job, as we were congratulated on our research and proposed changes. The next day we had a discussion group and brought up several subjects.

We found out that the exam was being written by a non amateur who saw twelve technical categories and wrote a question for each. We also found that the level of technical knowledge for the basic exam was creeping up to the advanced level. We felt we needed to make changes according to each level, and I also reminded the group that no question about operating had been asked.

At that time they had three classes of license and printed every exam in the exam book. It was the size of a telephone book and a real waste of paper. The exam was done four times a year. I suggested the offices order only copies of those exam types they needed. We also discussed the limit of just what you needed to know on a subject such as antennas, and we suggested specific, not vague, guidelines.

We also looked at the Morse exams. The big issue concerned perfect copy. People would take the exam, miss one letter and give up. We asked for, and received, an allowance of a few errors per session and the right to look over your copy. I also suggested that the three parts of the exam could be taken over a period of time, so that if a person missed one part he would still have the other two and a time to retry the part he missed.

A bank of multiple choice questions and volunteer examiners were also discussed. Volunteers for Morse exams were finally allowed, and subsequently, volunteer examiners were brought into force. I have been a volunteer examiner since nearly the start of the program. We were later to meet with Tom Adkins from the Canadian Radio Relay League, and started to form an approved bank of questions for the exam. Tom is another member of the Hall of Fame who passed away not long ago.

Later, Art had a terrible automobile accident and I was asked to become President of CARF. It was quite an honor, but also a responsibility. We had just hired a new office manager, Debbie Norman VA3RGM, and she had quite a time getting things back on the straight and narrow. Our computer system, which Art had designed, failed and the transfer to a commercial system was not completed. Debbie continued as office manager until a few years ago.

I had many interesting events during my

Indy racer 2009

Canadian Empress

three years as president. I was asked by a member of the Russian Embassy to go to Toronto to discuss the use of amateur radio on the ski mission over the pole. I really didn't know what I was getting into, but had some contacts with Ottawa before going. The fact that they wanted to come in near a military base at Alert, and the fact that we had no third party traffic agreements or reciprocal operating agreements, was a problem. While teaching at a local elementary school, a student announced over the PA system that I had a call in the office and that it was from Moscow. That created quite a stir!

A meeting with the Japanese delegation to discuss our amateur rules was quite a thrill. Our study guides had been sent to Moscow and Japan for their reference. Thanks to a great presentation by some Toronto area amateurs, wind profiler radars were prevented from being moved from 406 MHz to the Amateur 440 MHz band.

During this time, we were invited to Ottawa as part of a group to discuss the revamping of the amateur regulations, and a proposed bank of multiple choice questions. While meeting with Tom Adkins of the Canadian Radio Relay League, I asked why the two organizations could not join. The old animosity between the two was history and we should have a united voice. I am pleased to say that this started the amalgamation procedure. A few years after my term, while George Samson, VE3GWS, led our team, the Radio Amateurs of Canada (RAC) came about.

The DOC had reviewed the amateur regulations in many countries. They came up with the multiple choice question banks for approval and allowed voluntary examiners. I was particularly pleased with this, as I believe I started them along this line. We also started the use of bandwidth to allow what modes of transmission would be on each band. This allowed us to get the regulated sub-bands away from government regulation that required an act of parliament to change them. You can imagine how important this was to the House of Commons! Finally, we were able to set our own sub-bands within the band edges without unnecessary government oversight.

A single exam of 100 questions was arranged for the amateur license and a 50 question exam was set up for the Advanced certificate. Currently, the exam generator and question bank are available by internet from Ottawa.

During this time I also asked about the closing of Loran stations in the 1.8 to 2.0 MHz band, as stated in the marine radio regulations. This, I am sure, speeded up the removal of power and frequency restriction for Canadian amateurs on the 160 meter band. A request for voice on 7.050 to 7.100 was also approved.

In the early '90s I retired as president of CARF. I have since done some work for RAC, but other commitments limited this.

Retirement and Marine Radio

During my time with CARF, I met Paul Cook who was the local radio inspector. In fact, Paul administered the exams for my two licenses. He asked me if I was interested in conducting marine radio examinations for the DOC. I have been doing this for over twenty years and still enjoy it today. Usually, I issue 50 or more a year for everyone from kayak enthusiasts to new Coast Guard employees. I also became a member of the Coast Guard Auxiliary during this time and have received valuable training from them.

This training became useful in emergency situations, such as the famous ice storm of 2008 here in Kingston. During that event, my power was off for only a day and I was, for a time, the only link between Kingston and Toronto as the phones were all down. I handled HF traffic east of here and relayed it on VHF to Brockville as well.

In 2000, I retired from teaching and my marine career became more active. I worked on the local tour boats when needed and took more time to do some photography. I shudder to think how many ships and race car pictures I have.

Two partial seasons, 2007-08, as mate on the *Canadian Empress*, sailing from Kingston to Quebec City or Ottawa, gave me a chance to see the entire Seaway System. It was great to talk to stations I had heard for years.

In 2002, Chuck Millar passed away and a real gentleman was lost. Besides being an amateur, he was the announcer at CFRC Kingston's radio station until after the war. He also went over to the earlier mentioned CKWS for a few years. Watching him, I learned how to speak over a radio. It is ironic that CKWS has also left the air.

His daughter, Barbara, was kind enough to honor me with the chance to have his call, VE3GO. I hope I am keeping up the class associated with this call sign! And, I hope his grandson, Mark, will soon have his license and that call.

My contributions to the Boat Nerd website (**www.boatnerd.com**) led to a forwarded email from *MT* Editor-in-Chief, Rachel Baughn. She had asked if anyone on the site was a radio person as well as a ship enthusiast. I replied and said I would try to writing the column, provide photos and see what she thought. After six years, many columns, four features, and two covers I am still at it for *Monitoring Times*.

I'm currently retired as a ship's officer, but still do some historical commentaries for the boat lines. I continue to do amateur and marine licenses as well as write my column. My nephew Bert and I attend at least three major races a year.

My wife and I travel as we can and have been on some interesting cruises that have taken us to places I never thought I would see. I have done some VHF operating in Alaska and Bermuda and have listened to a portable shortwave set while in the Atlantic, Pacific and Caribbean. I guess we never lose our love for radio. Yes, the first station I listened to aboard ship was CHU Ottawa.

My shack contains several rigs and two computers, as well as two brass ship's clocks and my father's land line telegraphy equipment. In addition, a marine radio, AIS receiver and digital decoding software look after the marine side, while a digital scanner monitors the provincial police and other agencies.

I have an R-8 vertical dipole, a sloper and several vertical VHF antennas on the lot. I really live in an antenna disguised as a house.

My amateur activity covers from 80 meters to 70 cm frequencies on all modes. I still photograph race cars and ships for pleasure, though I have conceded to time and now shoot with a digital SLR. I am pleased that *Monitoring Times* has used my photos for my column and my race photos have been used by several teams and drivers.

As they say, everything old is new again. George Kennedy and I still have regular chats and meetings to discuss radio. I consider it an honor to have been the person to conduct his amateur radio exams. My clocks are still set to CHU and I still listen to the BBC. I will be conducting a marine exam this evening and will head off to Watkins Glen to watch Indy Cars tomorrow – with my scanner and camera, of course!

I would like to dedicate this article to my long time friend, Ben Kendall, VE6FN, who recently passed away in Edmonton. MT

VE3GO at the key

SCANNING REPORT

THE WORLD ABOVE 30MHZ

Dan Veeneman
danveeneman@monitoringtimes.com
www.signalharbor.com

Understand the System; Understand your Scanner

As with most technical specialties, scanning has its own set of words and phrases that have very specific meanings. Learning what all this jargon means is half the fun of our hobby. This month we take a look at some product and marketing descriptions that require some background knowledge to fully understand.

❖ Hawaii

Hello Dan,

I just read one of your web sites about trunking radio systems, and it was very interesting. My question is this, what is the difference in a P25 standard trunking system and a P25 one-frequency trunking system? Does the standard P25 cover a bunch of repeater sites in a given area? Does the P25 one-freq trunking cover just one given site in an area?

The reason I am asking, my wife and I are going to Oahu this September and the military bases on that Island use a P25 Pacmers system, and I am just hoping that I don't configure my BCD396XT wrong. They use a P25 Phase 1 (FDMA) and have eight sites on the island. I want to thank you for your time in this matter.

Best Regards,
Eric via the Internet

PACMERS

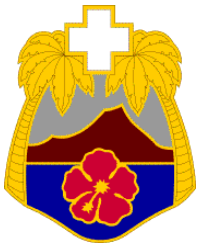
The Pacific Mobile Emergency Radio System (PACMERS) is a trunked radio system serving civilian and military users in Hawaii. It is directed by the United States Pacific Command (PACOM) and has been in operation since 2002. Repeater sites on the islands of Hawaii and Oahu serve more than 2,500 users. As the system grows and takes on new functions, the name of the system is changing from PACMERS to PLMRS-HI (Pacific Land Mobile Radio System - Hawaii).

PACMERS provides both voice and data services. Voice activity is in digital form and adheres to the APCO Project 25 (P25) Common Air Interface (CAI). Data services include direct access to National Crime Information Center (NCIC) and various other law enforcement databases.

PACMERS uses the Project 25 trunking standard on a number of frequencies in the 400 MHz UHF range. By the count of local and visiting monitors, there are two repeater sites on the Big Island of Hawaii and seven sites on Oahu:

Site	Island	Location
1	Oahu	Tripler Army Medical Center (Honolulu)
2	Oahu	Schofield Barracks (Wahiawa)
3	Oahu	Fort Shafter (Honolulu)
4	Oahu	Marine Corps Base Hawaii (Kaneohe Bay)
5	Oahu	Fort DeRussy (Waikiki)
6	Hawaii	Pohakuloa Training Area
7	Oahu	Haleiwa
8	Hawaii	
9	Oahu	Ka`a`awa

As you might expect, these sites are on or near military facilities. Tripler Army Medical Center (TAMC) is the headquarters for the Pacific Regional Medical Command. This coral pink complex is the largest medical facility on the Pacific Rim. Schofield Barracks is a 17,000-acre Army base in central Oahu and is home to the 25th Infantry Division. Fort Shafter is the oldest military installation on Oahu and houses the United States Army Pacific Command.



Fort DeRussy Military Reservation is in the Waikiki area of Honolulu and operates the U.S. Army Museum of Hawaii at Battery Randolph. Entrance to the museum is free and open to the public, where you can see artifacts and historical pieces related to combat in the Pacific.

These repeater sites transmit on the following frequencies:

Site	Frequencies
1	406.2625, 406.7375, 406.8375, 406.9125, 407.1250, 407.1750, 407.2375, 407.7625, 408.2625, 408.4750, 408.7625, 408.9125, 409.1000, 409.3625, 409.5625, 409.6625, 409.7625 and 410.4625
2	406.1875, 406.5375, 406.9750, 408.5625, 409.1625, 409.8625, 410.1000, 410.3625, 410.5625 and 410.8500
3	406.4375, 407.0375, 407.2750, 407.3375, 407.6375, 408.4250, 408.9250, 409.4500, 409.7875 and 410.5875
4	406.2375, 407.9875, 409.5875, 409.9625 and 410.1625
5	406.4625, 406.9000, 407.3625, 408.3875 and 408.8625
6	406.3625, 406.9625 and 407.3625
7	406.3625 and 409.4250
8	410.7625
9	406.2375 and 410.5625

The following talkgroups have been reported on the system:

Decimal	Hex	Description
163	0A3	Transportation Operations
166	0A6	Fort Derussy Military Police/Security
169	0A9	Fort Shafter Military Police
179	0B3	Schofield Barracks Military Police
180	0B4	Schofield/Wheeler Air Field Police
186	0BA	Waianae Army Police
225	0E1	Schofield Barracks Range Control
230	0E6	Schofield Barracks Range Control
1004	3EC	Federal Fire Department Operations 15
1011	3F3	Federal Fire Department Operations 2
1012	3F4	Federal Fire Department Operations 3
1013	3F5	Federal Fire Department Operations 4
1014	3F6	Federal Fire Department Operations 5
1015	3F7	Federal Fire Department Operations 6
1016	3F8	Federal Fire Department Operations 7
1017	3F9	Federal Fire Department Operations 8
1023	3FF	Federal Fire Department (Dispatch)
1034	40A	Operations
1089	441	NCTAMS Wahiawa
1090	442	Kalaeloa Navy Police (Secondary)
1092	444	Kalaeloa Navy Police (Primary)
1094	446	NAVSTA Pearl Harbor - Police
1097	449	NAVSTA Pearl Harbor - Police
1107	453	Operations
1197	4AD	Operations
1230	4CE	Operations
2010	7DA	Marine Corps Base Lifeguards
2061	80D	Marine Corps Base Hawaii Military Police 1
2062	80E	Marine Corps Base Hawaii Military Police 2
2063	80F	Marine Corps Base Hawaii Military Police 3
3001	BB9	Hickam Fire Tactical 12
3008	BC0	Hickam Fire (Dispatch)
3015	BC7	Hickam Air Force Base Security
3027	BD3	Hickam Air Force Base Ramp
3029	BD5	Hickam Air Force Base Air Ops
5029	13A5	Coast Guard Channel 16

Uniden BCD396XT

The Uniden BCD396XT is a handheld digital-capable scanner introduced in 2009. It has numerous features and covers several frequency bands, including the 400 MHz range in which PACMERS operates. It also supports a feature called "P25 One-Frequency Trunk."

Systems that use the Project 25 CAI can be either conventional or trunked. Conventional systems may have more than one licensed radio

channel, but conversations will always take place on a single channel. Different users are able to share this channel without having to hear one another through the use of Network Address Codes (NACs).

Each P25 transmission on these conventional systems will include a NAC. Receiving radios compare this NAC against their own pre-programmed NAC and only if they are the same will the radio unmute and deliver audio. In this way, only users that have the same NAC will hear each other.

The BCD396XT has the capability of searching for active NACs by monitoring the conventional channel. Because this mechanism allows multiple users to share a single radio channel, it is (somewhat confusingly) referred to as "one-frequency trunking."

PACMERS is a trunked P25 system, so you will want to select P25 "Standard" trunking rather than the "One-Frequency" type when programming your BCD396XT.

❖ North Carolina

Dear Dan,

I own a Radio Shack Pro-96 digital trunking scanner and I'm trying to track the North Carolina Voice Interoperability Plan for Emergency Responders (VIPER) system as I travel throughout the state on business. As you may know, VIPER is a Motorola Type II SmartZone Omnilink system, utilizing four large geographic zones to cover the entire State of North Carolina.

In programming my scanner, I have assigned one zone to each of four channel storage banks using control channel only programming, and I have assigned text tags to each control channel corresponding to the location from which that control channel is transmitting.

The problem is, many of the control channels use the same frequency, and, as such, the scanner may lock on to a control channel with a text tag I have actually programmed for another location. For example, in Zone 2, the Mecklenburg-Pineville, NC control channel frequency is identical to the Randolph County control channel frequency. So, on the same pass through the Zone 2 bank, the scanner may land on either text tag.

Is there any way to get the scanner to discriminate between the two identical control channels in order to accurately reflect the origin of the signal?

Thanks,
Kevin in South Carolina

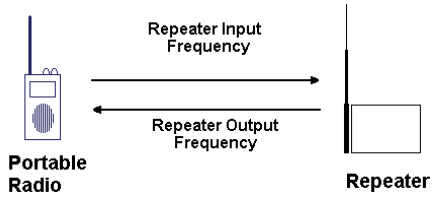
SmartZone and Omnilink are Motorola marketing terms for two of their trunking products. It may be helpful to review the networks and systems that comprise these products.

Motorola's first major foray into trunking was with a system called *Privacy Plus*. The term 'privacy' referred to the separation of conversations on a shared set of radio frequencies. Remember that on conventional (non-trunked) analog systems, each user can hear every other user, whether they want to or not, much like Citizen's Band (CB) radios today. The early Privacy Plus systems organized users into a hierarchical scheme of fleets and sub-fleets, which provided a means of separating conversations. Each radio was programmed with a fleet number and a sub-fleet number and would only unmute and pass audio when that specific combination of fleet and sub-fleet was active.

Other groups of users had different fleet and sub-fleet assignments, so if another group of users were talking, only their radios would be active. The radios from all other groups, which were not part of that fleet and sub-fleet, would stay silent.

Control Channel Operation

Those early two-way trunked radios, like the more capable radios that followed, communicate with a repeater site on two types of channels. The first is a voice channel, which is made up of a pair of radio frequencies. One

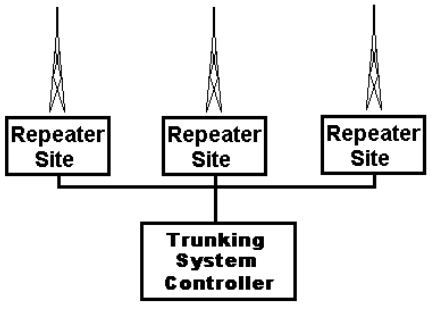


of the pair, called the *input frequency*, carries the sound from the radio's microphone to the repeater.

The other of the pair, called the *output frequency*, carries sound from the repeater to the radio's speaker or earphone. The sound in early systems was always in analog format and could be monitored by nearly any receiver, whether it was a scanner or not. Like today, most listeners tuned to the output frequency, since it was typically a much stronger signal than the input frequency.

The second type is a control channel, which is another pair of radio frequencies that carries talkgroup and frequency assignment information in a digital format that computers and microprocessors can understand. Keep in mind this digital format is completely different (and much older) than the digital voice formats used in some two-way radio systems.

When a user wants to speak and presses the push-to-talk button, the radio quickly transmits a channel request message on the control channel input frequency. The message includes the radio's pre-programmed fleet and sub-fleet numbers. The repeater forwards the message to the system controller, which is the central coor-



dinator for all of the activity on the system. The controller identifies an unused voice channel and assigns it to the fleet and sub-fleet contained in the request message.

It then sends a channel assignment message, containing the fleet and sub-fleet numbers along with a voice channel identifier, back to the repeater, which transmits it on the control channel output frequency. The radio receives this assignment message, tunes to the voice channel indicated in the message, and begins transmitting the sound from the microphone on the input frequency.

When not involved in a conversation, radios automatically tune to the output frequency of the control channel and listen for digital messages containing their fleet and sub-fleet numbers. When the radio receives a message containing a fleet and sub-fleet that matches its own pre-programmed numbers, the radio tunes to the voice channel output frequency that was included in the message and begins passing the audio out to the speaker.

Control Channel Format

The information carried in the control channel on the early trunked systems was sent in a specific format, referred to as Type I. This format of fleets and sub-fleets is supported by all trunk-tracking scanners and is specified through the use of fleet maps.

Years later, new performance requirements led Motorola to develop a second format, called Type II, which is more flexible and has become very common in public safety radio systems. All trunk-tracking scanners on the market also support this format.

Type II eliminated the fleet and sub-fleet hierarchies of the earlier format and replaced it with the concept of a single number called a talkgroup. Type II also introduced a four-digit number called a System Identifier (SysID) that uniquely identifies the trunked system. Channel requests, assignments, and other messages that flow on a Type II control channel carry talkgroup and system identifiers.

SmartNet

SmartNet is another Motorola marketing term that refers to a set of trunked system features, including individual radio identification codes, priority levels, emergency signaling, remote monitoring, and the possibility of digital voice encryption. SmartNet also includes the ability to create talkgroups as needed in a process called *dynamic regrouping*.

SmartNet systems use Type II control channels and can support up to 65,534 unique radio identification codes, 4095 talkgroups, and a maximum of 28 voice and control channels.

SmartZone

If the needs of a system outgrow what SmartNet can provide, Motorola offers SmartZone, which connects multiple trunked systems into one large network. All of these individual systems are connected to a Zone Controller, which oversees all of the frequency assignments and audio paths at each repeater site.

SmartZone networks are still limited to 28 channels per repeater site but can link together as many as 64 sites, providing coverage across a large geographic area. Voice activity can be analog, digital, or mixture of both. Control channels use the Type II data format.

OmniLink

If the needs of system outgrow even a SmartZone, like the North Carolina VIPER network, Motorola offers a software product called OmniLink that connects as many as four SmartZone systems together. Each SmartZone network is still directed by its own Zone Controller and retains its own unique system identifier, but each of the Zone Controllers are connected and controlled by a Master Controller. OmniLink can support up to 192 repeater sites.

North Carolina VIPER

The State of North Carolina operates the Voice Interoperability Plan for Emergency Responders (VIPER), which is a statewide public safety trunked radio system. As Kevin reports, it is a Motorola SmartZone OmniLink system. There are four zones in the system with the following system identifiers:

Zone	SysID
1	6038
2	C123
3	C508
4	C920

Kevin already has his PRO-96 configured with each zone in its own channel storage bank. This causes the scanner to treat each zone of the system as an independent trunked network. Some of the PRO-96 pre-loaded Virtual Scanner data for OmniLink systems, such as the State of Louisiana, have all of the control channel frequencies in a single bank.

The control channel messages originating from repeaters in each zone contain their respective system identifier, so the information necessary to distinguish between zones is available to the PRO-96. If you are having difficulty distinguishing between Zones (Kevin is not), here are a couple of things to try.

Radio Shack makes the recommendation of locking out the distant control channel frequency entry in order to allow the same nearby frequency to be tracked. In other words, if you are in traveling in Zone 2, they recommend locking out the channels in the bank in which you've stored Zone 1 frequencies. Tedious, to be sure, although you can also turn off the entire channel storage bank by pressing the bank number while scanning.

A more data-intensive option is to create duplicate talkgroup ID lists for each channel storage bank. For instance, create a master talkgroup list for Zone 1 with a Text tag that identifies the zone, like "1-NCHP." Then, using one of the software tools listed below, create additional talkgroup lists for each of the other three zones, substituting the appropriate zone number for each.

Simulcast

If I understand his letter correctly, Kevin is attempting to distinguish between two control channels, both operating on the same frequency in the same zone. I don't believe this is possible on the PRO-96, since the VIPER system operates in what is called "simulcast" mode.

Simulcast is short for "simultaneous broadcast." It means that the same signal is being sent from more than one transmitter at the same time. The system operator usually sets up a simulcast system when there is a concern about coverage throughout a geographic area. Terrain blockages and obstructions may make it difficult or impossible to provide a good signal from just one repeater site, so one or more additional sites at different locations are set up to transmit an identical signal that will avoid or overcome the blockage or obstruction.

Because the signal from each site is identical, the PRO-96 will have no way of knowing which repeater site it is actually hearing. Because the content of the signals should be identical, Kevin shouldn't miss any of the action regardless of which site he's receiving.

700 MHz Operation

Keep in mind that the VIPER system has some frequencies in the 700 MHz range, particularly in the Raleigh/Wake area, for on-scene operations. The PRO-96 cannot trunk-track activity on those frequencies, although with some work it is able to provide the audio content and report control channel activity on the serial data port. You'll want to add the following frequencies to your list:

Frequency	Description
764.150	Direct 1
764.175	Direct 2
764.200	Direct 3
764.400	Direct 4
794.400	Vehicle Repeater

❖ PRO-96 Software Tools

There are several useful computer software programs that add to the PRO-96's functionality. Win96 (**www.starrsoft.com/software/win96**) allows you to read and write frequencies and talkgroups to and from the scanner as well as manage various hidden features, including the Virtual folders, extended trunking tables, and "extended frequency coverage" for 200 and 300 MHz military aircraft (MilAir) and 700 MHz conventional reception.

Arc96 (**www.butelsoftware.com**) offers similar data management features with a different user interface.

For the more technically minded who are near an APCO Project 25 trunking system, Pro-96Com (**www.psredit.com/pro96com**) is a control channel decoder that monitors the serial port data stream and provides a real-time display of the P25 standard 9600-baud trunking protocol. There is even a dedicated interest group for this program on Yahoo! (**groups.yahoo.com/group/pro96com**).

That's all for this month. You can get more frequencies and radio-related information, including detailed scanner comparisons, on my website at **www.signalharbor.com**. I welcome your comments, questions and reception reports via electronic mail to *danveeneman@monitoringtimes.com*. Until next month, happy scanning!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Q. *Can I combine a Scantenna and a Cellular Yagi antenna with a TV antenna splitter to get better 800 MHz reception, or would they reject each other? (Joe K, email)*

A. If they are in phase for an incoming signal, that will work. The problem is that there will be certain angles toward the signal that the two will be 180 degrees out of phase, and thus the signal will be lowered. Of course, you can always put the array on a rotator and simply turn it for maximum signal strength – that would be where the signal is arriving in phase between the two antennas.

Q. *I have a Blaupunkt car radio that belonged to my cousin in Italy. It has the following bands written on the label on the radio: UKW, KW, LW, MW. What frequencies or bands are these? (Jon C., Naples, FL)*

A. Since Blaupunkt is a German product, the designators are in German. Here are their equivalents: UKW, 80-100 MHz FM; KW, short wave AM; LW, 150-340 kHz long wave; MW, 520-1640 kHz medium wave AM.

Q. *It seems like the next big fad could be "wireless electricity" in which power is radiated into a home or office, and picked up by sensors rather than conducted by wire. Is this an old idea whose time has come, or are we in for yet another source of wideband noise once this idea gains significant market share? (Ken, email)*

A. Unless the laws of physics change substantially, I don't see this mode of power transmission coming in the foreseeable future. The problem is not one of interference, but efficiency.

While the promoters say that they get upward of 90% efficiency when an inductively-coupled accessory like a toothbrush is sitting right on the charger, the promoters are speculating the invisible transmission of power throughout buildings to power lamps, computers, TVs, and other accessories.

At such separation, the efficiency drops dramatically. When you hear a distant base station on your scanner, it's the results of hundreds of watts in the transmitting antenna dwindling to millionths of a watt by the time the signal reaches you.

Promoters continue their argument by saying they would wrap the building in wire coils so that you and your equipment would be in the middle of the electromagnetic field. No thank you! Not only are there conceivable health concerns from such an arrangement, but you're still not saving wire.

Electrical cords in the home and office are still the answer for much time to come.

Q. *I am interested in improving my AM DXing of high-power broadcasters along the U.S. East Coast. I currently have an ICOM R-75 communications receiver and several portables, as well as wire antennas with their broadsides favoring the East Coast. (Tom Gallagher, Troy, AL)*

A. You already own an excellent AM receiver; if you aren't satisfied with your reception, then we need to look at your antennas.

Many AM DXers use loop antennas to null co-channel interference. The main problem is that it is best mounted some distance away from your home to avoid electrical interference.

If electrical noise is a problem, you may need a good noise canceller like the Timewave: **www.grove-ent.com/dsp599zx.html**.

Of course, time of day/night monitoring is a factor as well because of signal propagation and high/low power changes mandated by the FCC on nighttime broadcasters.

Q. *I erected a 60 foot tower with a high gain HDTV antenna and pre-amp located at the top of the tower.*

My FM reception is really good; I can listen to FM stations from Tampa 110 miles away, but a local station on 102.7 MHz overloads my tuner so that I hear them on several spots across the dial.

Is there a sharp, one frequency notch filter that would only attenuate the offending signal without impacting other FM frequencies? (John Bulmer, K3JAB).

A. Chances are that it's the antenna preamp that's getting overloaded and sending those phantom signals down, so the first thing you should do would be to take that out of the system to see if it takes care of the problem.

If it does, then see if you can live with the signal levels of the other stations since no notch filter is going to notch out just 102.7 without spreading its attenuation several megahertz up and down the dial.

Finally, if the Tampa target is substantially in a different direction from the offensive 102.7, then move the beam around until it finds a null for the offender, reducing the images. Just hope that it's a direction that still allows Tampa reception!

As last-ditch effort, you might want to try a receiver with better image/overload rejection.

Q. *Why do I receive greater distance on the 20 meter band than 40 meters? On 20 meters I hear ham radio operators from around the world, but on 40, I only hear U.S. operators. (Rene Puente, San Diego, CA)*

A. Let's think of these bands in terms of frequency. At the lower frequencies, signals propagate more directly, often following the curvature of the earth, while at higher frequencies they take off over the visual horizon and proceed skyward.

The electrically-charged upper layers of the atmosphere (the ionosphere) behaves differently on higher and lower frequencies as daytime solar radiation energizes them. Higher-frequency signals are more likely to be reflected back down to the earth, thus skipping over great distances and heard remotely, while lower frequency signals are more likely to be absorbed by the ionosphere, limiting the distance over which they can be heard as the signal dissipates traveling over the earth's surface.

Questions or tips sent to Ask Bob, c/o MT are printed in this column as space permits. Mail your questions along with a self-addressed stamped envelope in care of MT, or e-mail to bobgrove@monitoringtimes.com. (Please include your name and address.)

UTILITY WORLD

HF COMMUNICATIONS

Hugh Stegman, NV6H
hughstegman@monitoringtimes.com
www.ominous-valve.com/uteworld.html
http://mt-utility.blogspot.com

Spy Bust Reveals Radio Intrigue

On June 27, 2010, the United States Federal Bureau of Investigation arrested 10 suspects who allegedly operated as deep-cover intelligence agents for the Russian Foreign Intelligence Service (SVR). An eleventh suspect was arrested trying to flee Cyprus. He later jumped bail and vanished.

In two criminal complaints, the FBI accused these individuals of activities right out of spy novels. These included dead drops, brush-by exchanges, secret envelopes stuffed with cash, invisible writing, and (best for us) covert radio communication.

Page 4 of complaint number two describes a covert web of "Illegals," as the SVR allegedly called them. All 11 supposedly received "extensive training" in a Moscow headquarters called "Center."

This training, as duly noted in breathless news media accounts, is said to have included, "short wave radio operation and invisible writing," and "the use of codes and ciphers, including the use of encrypted Morse code messages" (section 8).

Page 11 of this same document mentions short wave radios found on the defendants' premises. They were supposedly used to receive "radiograms."

These messages are not described in detail. Enigmatically, the FBI says only that "radiograms generally sound like the transmission of Morse code."

Page 12, however mentions "irregular electronic clicking sounds associated with the receipt of coded radio transmissions." Section 31 makes reference to alleged discussion of "radio from over there."

The Internet is full of speculation on what all this might mean. Was "Morse code" the infamous "cut number" station from Cuba? Was the "clicking" some kind of burst transmission slowed down later by computer? We just don't know.

We get another tantalizing clue in section 30, regarding "spiral notebooks" with pages containing "apparently random columns of numbers." These are alleged to be "codes used to decipher radiograms." Were these the one-time decryption keys that are commonly used with "numbers" stations?

❖ Steganography

Page 9 of the same document describes extensive use of "steganography." This term comes from the Greek for "concealed writing." It refers to any means of hiding messages in routine information in such a manner that only those who already know of their existence can find and decipher them. It's probably as old as human interaction itself.

In this case, the alleged Russian spies are said to have sent and received hidden encrypted text by slightly manipulating the bits in ordinary image files downloaded from the Internet. This process is known as image steganography, and its use is described on many web sites. There's nothing top-secret about it, though the "Illegals" are said to have used custom software supplied by Russian intelligence.

In general, any large media files, including the ubiquitous MP3 music downloads, provide a great place to hide things. There's always some extra room.

The Internet is new and sexy, but good old short wave radio has always seen its own share of concealed messages. History is full of documented examples.

One system, known to have been used by a large government broadcaster, used music choices to signal agents abroad. A certain tune at the right time meant something was up. Anything else meant carry on. Similarly, more than one utility station has been known to hide content for unknown listeners in routine-sounding traffic. It can all get rather bizarre at times.

❖ Translating Vietnamese Numbers

Let's turn to the more obvious senders of "secret" messages.

Several people, myself included, have obtained translations of the mysterious Vietnamese language "numbers" station. This one still broadcasts daily at 1600 Coordinated Universal Time (UTC). The frequency is 10255 kilohertz (kHz), in upper sideband (USB) voice. The same recorded transmission is repeated every day until a new one is made.

Native Vietnamese speakers have all agreed that the several announcers heard so far all speak a dialect peculiar to the northern part of the country. Opinions differ, though, on the initial callup.

Most translations indicate that "Lighthouse" (hai dang) is the name of the station or person being called by someone identifying as "Son Ca," which might refer to a cay island. One, however, offered the alternate suggestion that "Lighthouse Cay" is calling "Station 5253." Still another thought it might be all one station identifier, as in "Lighthouse Station 5253."

Next comes "Number," with a 5-figure group, presumably a message identifier. Then comes "Number of groups" with the group count. After this comes a date in month/ day/ 4-figure year format, then "Content is beginning."

Following the message in 5-figure groups, the broadcast ends with "Son Ca" again calling "Hai Dang 5558." Note the different number from the initial callup. It's hard to hear, but it's there.

It is still not known whether the broadcast is from an intelligence agency or some kind of maritime shipping company. Some have suggested that a shipping company would not repeat the same recording for weeks at a time, though an intell operation might well do just that.

The best work on this station has been done by "Token," who we have mentioned previously. He has a rhombic antenna, and a quiet location in California. His definitive web page on the subject is at **home.mchsi.com/~token_radio/VTN.htm**

❖ New Chinese Numbers Frequency

The easiest way to change anything in utility radio is for me to do a column on it. This happened again right after I sent off the May column regarding a strange Chinese-speaking numbers broadcast usually translated as "Star Star Radio Station." It almost immediately turned up on a new frequency.

Star Star Radio is often referred to as V13, the designator given by the authoritative European Numbers Intelligence Gathering and Monitoring Association (ENIGMA). In the past year or so, it's only been reported on 11430 kHz. Now we can add 10522 kHz, in standard double-sideband amplitude modulation (AM).

Notice the similarity between 10225, the Vietnamese frequency, and 10522, where V13 appeared in a generally similar time frame. Either this means something, or I have just been thinking about radio intrigue too much.

Like the other V13 broadcasts, this one ("Radio Four") is weak. It's best heard on the US West Coast and in parts of Europe. It begins on the hour, with loggings from various people at 0500, 0600, 1200, and 1300 UTC.

The 0600 has been heard here as well, though really far down in the noise. Attu Bosch, in Alaska, hears something at 0500 which may well be V13. Finally, "DJ" (who also goes by "Westli") has heard a much weaker V13 signal (different beam?) at 0700 and 0800 on 10182 kHz.

DJ/ Westli served in the US Air Force as an intercept linguist specializing in Chinese, Hebrew, and Spanish. His excellent web page contains some very interesting analysis of V13. It's especially good on the never-ending discussion of "Star Star" versus "New Star" for the best translation.

DJ is yet another California listener. We're starting to get some nice talent out here. His web page is reached from **www.kentfoto.com/spooks**

❖ Quick COTHEN Survey

COTHEN stands for Customs Over-The-Horizon Enforcement Network. It's becoming the busiest US Government net. As a consequence, it's been adding more USB Automatic Link Establishment (ALE) frequencies.

I wanted to see how much the new frequencies were being used. For a month, I added thousands of individual ALE hits to a spreadsheet. In order to avoid results being skewed by propagation, I also put in every log I could find online for the period.

Here are the most often logged COTHEN frequencies, in descending order: 8912, 7527, 10242, 11494, 13907, 15867, 12222, 14582, 13312, 20890, 5732, 18594, 5909.5, 23214, 25350, 20662, 5250, and 4614.5. That last one had no hits at all.

It's evident that a majority of COTHEN users have put some or all of the new frequencies into their scans. It's best to scan them all, even if the bottom two seem to be dead.

See you next month!

ABBREVIATIONS USED IN THIS COLUMN

AFB..... Air Force Base
ALE ..... Automatic Link Establishment
AM..... Amplitude Modulation
ARQ..... Automatic Repeat reQuest
CAP ..... US Civil Air Patrol
COTHEN..... US Customs Over-The-Horizon Enforcement Network
CW ..... On-off keyed "Continuous Wave" Morse telegraphy
DSC..... Digital Selective Calling
EAM..... Emergency Action Message
FAX ..... Radiofacsimile
FEMA ..... US Federal Emergency Management Agency
FM..... Frequency Modulation
HFDL ..... High-Frequency Data Link
HF-GCS ..... High-Frequency Global Communication System
JISCC..... Joint Incident Site Communications Capability
LDOC ..... Long-Distance Operational Control
LSB ..... Lower Sideband
M01c ..... Russian CW numbers, short-message variant
M08a..... Cuban CW/MCW numbers, cut to ANDUWRIGMT
M89..... Chinese military 4-figure changing CW calls
MARS ..... US Military Auxiliary Radio System
MCW ..... Modulated CW, tone or AM
Meteo ..... Meteorological Office
MFA ..... Ministry of Foreign Affairs
MX..... Generic for Russian single-letter beacons/ markers
NASA..... US National Aeronautics and Space Administration
PACTOR ..... Packet Teleprinting Over Radio, modes I-III
PR..... Puerto Rico
PSK..... Phase-Shift Keying
RTTY ..... Radio Teletype
S28..... Russian "Buzzer" marker, voice & data heard
Selcal ..... Selective Calling
SHARES..... SHAred RESources, US Federal frequency pool
SITOR..... Simplex Telex Over Radio, modes A & B
STANAG..... STAndardization AGreement
STANAG 4285.. Military 8-state PSK radio modem
UK..... United Kingdom
Unid ..... Unidentified
US ..... United States
USAF..... US Air Force
USCG ..... US Coast Guard
VHF ..... Very High Frequency (30-300 megahertz).
Volmet..... Scheduled aviation "Flying Weather" broadcast

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time). "Numbers" stations have their ENIGMA (European Numbers Information Gathering and Monitoring Association) designators in ().

17.2 SAQ-Grimeton Radio, Sweden, CW special event using Alexanderson alternator transmitter, tuning at 1142, then message (not copied) at 1200 (MPJ-UK).

147.3 DDH47-German Weather Office, Pinneberg, RTTY sea area forecast and warnings, at 1646 (MPJ-UK).

1888.0 IPD-Civitavecchia Radio, Italy, female with weather forecast in Italian, at 1948 (MPJ-UK).

2142.5 ZLST-German Customs Control Post, Cuxhaven, working ZBOR (Customs Cruiser Borkum), also 4553.5, ALE at 2118 (MPJ-UK).

2749.0 Halifax Coast Guard Radio-Canadian Coast Guard, NS, weather forecast at 0243 (Jack Metcalfe-KY).

3330.0 CHU-Canadian National Research Council (NRC), Ottawa, standard time signals with announcements in English and French, in H3E (full-carrier, upper sideband), simulcast on 7850, at 0355 (PPA-Netherlands).

4109.0 RHY47-Russian Navy vessel working RMP, Kaliningrad, also on 5385.5, CW at 0845 (ALF-Germany).

4200.0 Unid-Probable fishing boats, two males shooting the breeze in Spanish with salty language, at 0358 (Prez-MD).

4331.0 4XZ-Israeli Navy, Haifa, CW marker at 0254 (Metcalfe-KY).

4348.0 KW-Pakistani Navy, Karachi, calling PNSBABUR, ALE at 1931 (PPA-Netherlands).

4441.0 IDR-Rome Radio, Italy, identifying "Roma" at 1421 (Michel Lacroix-France).

4457.0 RHI-Saudi Air Force, calling AAI, also on 5405, ALE at 1956 (PPA-Netherlands).

4540.0 SCC43NG-43rd National Guard Civil Support Team, SC, calling SCRD, Special Communications Requirement Division, MD; also uses 4540, 5045, 5211 7720, 10493, 11608.5, 13586.5, 14483.5, and 14502.5; ALE at 1626 (Metcalfe-KY).

4593.5 AFA3WZ-USAF MARS, controlling NE2S1 net, at 2344 (MDMonitor-MD).

4625.0 "The Buzzer"-Russian AM channel marker for UZB76 (S38), making intermittent buzzing noises, spurious signals near 4585, 4666, 4707, and 4745; at 0055 (Ary Boender-Netherlands).

4742.0 Ascot 6608-UK Royal Air Force C-17A number ZZ172, selcal JM-BQ, on the Tactical Air Sea Communication (TISCOM) net, at 0725 (Lacroix-France).

5060.2 WGM-CruiseEmail, Fort Lauderdale, FL, CW identifier in PACTOR traffic, at 0240 (ALF-Germany).

5065.0 9MV-Malaysian Navy, Lumut, CW message in 5-letter groups to 9MNF (Hydrographic Survey Ship 151 KD Perantau), at 1828 (PPA-Netherlands).

5206.0 Control-UK Royal Navy Flag Officer Sea Training, working KK and, KI, at 0619 (Lacroix-France).

5320.0 Cypress-USCG Cutter Cypress, with Cutters Juniper, Oak, and Resolute, in possible Gulf of Mexico oil spill ops, at 0116 (Metcalfe-KY).

5391.0 LBJ-Norwegian Navy, Bodo, working LABS (Guided Missile Destroyer Otto Sverdrup), at 1920 (PPA-Netherlands).

5434.0 MSN1-UK Army, working AAAC32, ALE at 1252 (ALF-Germany).

5456.0 RGR35-Russian Navy, hand sent CW message for RJC66, at 1846 (PPA-Netherlands).

5464.0 Dali-French Coast Guard, working Clipper 62 in French, at 0720 (Lacroix-France).

5517.0 Tripoli-African Area 3 air control, Libya, position from Alitalia 954 at 0155 (Prez-MD).

5520.0 New York-Caribbean Area B air control, position from Springbok 208 (South African Airways), then gave aircraft 5598 kHz primary and 3016 backup for Santa Maria, at 0157 (Prez-MD).

5652.0 004-HFDL ground station, Riverhead, NY, uplinks at 0427 (PPA-Netherlands).

5696.0 Coast Guard Rescue 014-USCG, working unknown station at 1400 (Metcalfe-KY).

5699.0 Kinloss Rescue-UK Royal Air Force, working helicopter Rescue 1212, at 1430 (Lacroix-France).

5714.0 "9-A-Y"-French Navy, coordinating RTTY (on 5416 kHz) with "2-W-O," at 0904 (ALF-Germany).

5725.0 "6-D-J"-UK Military, tracking net with "2-P-X" and "C-E-R," at 2018 (PPA-Netherlands).

5728.5 HBM46-Swiss Army, French "Voyez Le Brick…" SITOR-B test loop, also on 5846.5, at 0850 (ALF-Germany).

5800.0 Cuban MCW cut numbers (M08), callup and 5-letter-group message, at 0600 (PPA-Netherlands).

5898.0 Cuban CW M08a, in progress at 0505 (PPA-Netherlands).

6330.5 OSY-SailMail, Belgium, working vessel in PACTOR-II, also on 8422, at 1825 (PPA-Netherlands).

6435.5 HEB-Bernradio, Switzerland, CW identifier in PACTOR idler, then traffic list at 1800 (PPA-Netherlands).

6501.0 NMN USCG, VA, "Iron Mike" weather voice, parallel 8764, at 0409 (PPA-Netherlands).

6519.0 WLO-Mobile Radio/ ShipCom, AL, weather and traffic list in female machine voice, at 0400 (Prez-MD).

6532.0 G-VNAP-Virgin Atlantic A340 "Sleeping Beauty,"' flight VS0023, HFDL position for Shannon, at 1554 (MPJ-UK).

6535.0 Dakar-African Area 1 air control, Senegal, position from Lufthansa Cargo 8272, at 0319 (Prez-MD).

6628.0 GAF Medical 1-German Air Force CL-600 Challenger 601, number 12+04, selcal CJ-GL and position for Santa Maria, at 0245 (ALF-Germany).

6670.0 Unid-Male reciting alphabet in military phonetics, possible "Echo Charlie" unlicensed activity, LSB at 2135 (Prez-MD).

6673.0 San Francisco-Central West Pacific air control, position check and weather with American 254, handed off to Los Angeles Center on VHF 132.15, at 0315 (Prez-MD).

6676.0 HSD-Bangkok Volmet, Thailand, airport weather observations at 1811 (PPA-Netherlands).

6690.0 NAS Operations-Possible Saudi Arabian National Air Services LDOC, working Gulfstream G-IV (HZ-MF4), Saudi Ministry of Finance, at 0050 (ALF-Germany).

6712.0 Log Roll-US military airborne command post, working Quick Plane at 1518 (Metcalfe-KY).

6760.0 Xenon Echo-French Navy, working Papa India in French, at 0736 (Lacroix-France).

6761.0 Mash 82-USAF tanker, setting up refueling track with unknown aircraft, at 1541 (Metcalfe-KY).

6765.1 HSW-Bangkok Meteo, Thailand, musical chime and "female" weather voice, at 1826 (PPA-Netherlands).

6834.0 K5R-Lithuanian Military, working R1M, ALE at 0910 (ALF-Germany).

6999.5 GLOBUS-Possible Russian military, working STAVKA in packet radio, also on 7001, 7001.5, and 7002, at 2205 (ALF-Germany).

7310.0 A060RN-Arkansas National Guard, North Little Rock, calling T43DE1, Delaware, scanning 16 other frequencies, ALE at 1628 (Metcalfe-KY).

7402.0 Unid-Russian Air Defense (PVO), formatted CW tracking datagrams at 0855 (ALF-Germany).

7527.0 CPDST-Unknown COTHEN player, ALE sounding at 0211 (ALF-Germany). [Logged here on 8912, 11494, 12222, and 14582. -Hugh]

7584.0 TZSE2-Spanish Guardia Civil, North Africa, working control station TXX1, ALE at 1944 (ALF-Germany).

7602.0 3A7D-Chinese military calling marker (M89), CW to DKG6 at 2137 (MPJ-UK).

7603.0 70-Singapore Navy Frigate Steadfast, calling CN4, ALE at 1940 (PPA-Netherlands).

8012.0 201SERCAP-CAP Southeastern Region station, ALE sounding at 0305 (ALF-Germany).

8122.0 Mediterranean Cruisers Net-Daily "MedNet" check-ins by small vessels, at 0530 (PPA-Netherlands).

8143.0 KW-Pakistani Navy shore station, working BABUR (Destroyer Babur), and BADR (Destroyer Badr), ALE and data traffic at 1739 (ALF-Germany).

8225.0 LOSLLANOS1-Venezuelan Navy vessel Los Llanos, working BNARCO1, Puerto Cabello, LSB ALE at 0309 (ALF-Germany).

8294.0 Unid-German speaking male, mentioned Norfolk (VA?) to unheard station, at 1155. RDC-USCG Cutter Campbell, ALE sounding at 2130 (MDMonitor-MD).

8416.5 VFF-Canadian Coast Guard, Iqaluit, SITOR-B navigation area XVII and XVIII warnings, then weather forecast, at 0330 (PPA-Netherlands).

8419.5 PPR-Rio Radio, Brazil, CW identifier in SITOR-A idler, at 2149 (MPJ-UK).

8500.0 T8R1-Venezuelan Navy headquarters, calling vessel 7P4S, LSB ALE at 2322 (MDMonitor-MD).

8503.0 NMG-USCG, New Orleans, LA, Gulf FAX high seas forecast at 0250 (Prez-MD).

8681.0 NMC-USCG, Pt. Reyes, CA, Pacific FAX sea state chart at 0205 (Prez-MD).

8688.9 WHL 28-AugTec LLC, St. Augustine, FL, CW identifier in PACTOR markers for maritime Internet gateway, at 0554 (PPA-Netherlands).

8734.0 SVO-Olympia, Radio, Greece, voice-mirror English and Greek female with identifier and service information, at 0347 (Prez-MD).

8759.5 NAVIDATA-CW identifier of mysterious coastal station, possibly Brazil, in PACTOR idler, at 0237 (ALF-Germany).

8846.0 New York-Caribbean air route net A, position from Jet Blue 832, at 2307 (MDMonitor-MD).

8857.0 Shannon Volmet, formatted aviation weather observations at: 2319 (MDMonitor-MD).

8879.0 Mumbai-Indian air route control, selcal JM-LR to Arabia 459, an A320 registration A6-ABB, at 2050 (Lacroix-France).

8894.0 011-HFDL ground station, Panama, working flights at 0307 (ALF-Germany). N'djamena-African Area 2 air control, Chad, position from an Air France flight, at 0150 (Prez-MD).

8903.0 Kinshasa-African Area 4 air control, Congo, position from Air Kenya 500, at 2340 (Prez-MD).

8942.0 G-VWIN-Virgin Atlantic A340 "Lady Luck," flight VS001K, HFDL position for Shannon, at 1618 (MPJ-UK).

9047.0 0011DCCAP-CAP, DC, ALE sounding at 2343 (MDMonitor-MD).

9067.7 SSE-Egyptian embassy, SITOR-A message, also on 17426.7, at 1814 (Lacroix-France).

9081.5 OPSFMH-US Military ground station, working helicopter R626, also on 6911.5 and 7361.5, at 0024 (Metcalfe-KY).

9110.0 NMF-USCG, Boston, MA, FAX weather chart at 2050 (MPJ-UK).

9219.0 AAA-Israeli Air Force control, Tel Aviv, ALE sounding, also 9228, at 1817 (MPJ-UK).

10057.0 San Francisco-Pacific oceanic air control, position from Air Canada 986, at 0223 (Prez-MD).

10066.0 VT-ING-Etihad Airways A320, flight ETD231, HFDL position at 1848 (MPJ-UK).

10155.0 CHPNSC141P-AT&T, Chapin, SC, calling HSTNTX162 (Houston, TX), PHNX-AZ212 (Phoenix, AZ), PRCYHI220 (Pearl City, HI), RENONV224 (Reno, NV), and SANATX236 (San Antonio, TX); all ALE at 1700 (MDMonitor-MD).

10206.0 DREW-German Navy mine hunter Groemitz (M-1064), voice and STANAG 4285 with unidentified station, at 0759 (Lacroix-France).

10468.0 RHL-Saudi Airfields Net, working AAL, ALE at 1805 (MPJ-UK).

10536.0 CFH-Canadian Forces, Halifax, NS, RTTY weather at 0940 (Eddy Waters-Australia).

10538.6 Sector Key West-USCG, FL, working Swordfish 14, USCG on drug or customs op, at 1509 (Metcalfe-KY).

10588.0 WGY908-FEMA Region 8, CO, ALE and voice checks with WGY947, Iowa State Emergency Operations Center, at 1510 (Metcalfe-KY).

10640.0 Q2M-Unknown Chinese government/military, calling NYZ, CW at 0724 (Waters-Australia).

10755.0 Unid-Possibly Russian "M1" family (M01c?), CW preamble "975 608 608 16 16," then message in 5-figure groups, at 1702 (MPJ-UK).

10780.0 Cape Radio-USAF, Cape Canaveral, FL, patching Rican 75 (PR Air National Guard C-130) to San Juan, at 1643 (Allan Stern-FL).

11175.0 Andrews-USAF HF-GCS, Andrews AFB, MD, 32-character EAM and gone, followed by (sounded like) Tank Car with "standing by for traffic," at 0030 (Jeff Haverlah-TX).

11217.0 PXJNNN-US Navy/Marine Corps MARS, voice call NNN0PXJ, working KGD34, SHARES Master Control, VA, ALE at 1329 (Metcalfe-KY).

11282.0 San Francisco-Pacific oceanic air control position from USAF Reach 904, at 0227 (Prez-MD).

11300.0 Tripoli, positions from Springbok 260 and Iran Air 355, at 0026 and 0033 (Prez-MD).

11451.0 SPFDIL248-AT&T, Springfield, IL, calling WPTNNJ256, West Patterson, NJ, at: 2130 (MDMonitor-MD).

12124.0 034MERCAP-CAP Middle Eastern Region (US), apparent region discrete frequency, ALE sounding at 1400 (MDMonitor-MD).

12222.0 Omaha 99-US Customs aircraft, relaying weather conditions to Hammer, March Air Reserve Base, ALE and voice at 1518 (Metcalfe-KY).

12577.0 002241021-Bilbao Radio, Spain, DSC with 372549000 (Panamanian registry container ship Star Best, 3EJK6), at 0949 (PPA-Netherlands). A8AP5-Liberian registry tanker Ligovsky Prospect, DSC safety check attempts with Lyngby and Madrid, no joy at 1710. H9XG-Panamanian registry bulk carrier Lowlands Phoenix, DSC safety test with CROSS Corsen (French maritime control), at 1738 (MPJ-UK).

12704.5 JMJ2-Tokyo Meteo, Japan, FAX weather map, also on 13988.5, at 0603 (Waters-Australia).

12916.5 HLF-Seoul Radio, Korea, CW marker at 1824 (PPA-Netherlands).

12923.0 HLW2-Seoul Radio, Korea, CW marker at 1724 (MPJ-UK).

12935.0 HLG-Seoul Radio, Korea, CW marker at 1823 (PPA-Netherlands).

13128.0 TAH-Istanbul Radio, Turkey, weather in Turkish at 1806 (PPA-Netherlands).

13479.0 REA4-Russian Air Force strategic broadcast, digital bit reversal idler, at 0957 (MPJ-UK).

13488.0 WGY 9030-FEMA, calling the weekly National Public Health Radio Network (NPHRN); raised WGY 909 (FEMA, San Francisco) and WNG971, (Tulsa Health Department, OK), then switched to ALE, at 1443 (Metcalfe-KY).

13523.7 Unid-Egyptian MFA, Cairo, selcalling XBVQ (Paris embassy), SITOR-A at 1855 (PPA-Netherlands).

13988.5 JMH4-Tokyo Meteo, noisy FAX satellite image at 1921 (PPA-Netherlands).

14396.5 WUZ-US Army Corps Of Engineers, AL, SHARES weekly net with KTQ315 (Environmental Protection Agency, IL), KNNN808 (Southwestern Bell, MO), and WNG954 (Oregon Public Health), at 1612 (Metcalfe-KY).

14442.5 Unid-North Korean diplomatic, ARQ message at 0605 (PPA-Netherlands).

14455.0 KHA959-NASA Wallops Island Flight Facility, VA, in a net with KHA908 (Mountain View, CA) and KHA946 (New Orleans, LA), at 1628 (Metcalfe-KY).

14502.5 A060RNJISCC-AR National Guard JISCC, calling T57AR1, ALE at 1438 (Metcalfe-KY).

14556.0 RIW-Russian Navy, Moscow, CW duplex checks with RKW95 and RCIG, at 1756 (PPA-Netherlands).

14650.0 BOSTON20SRGIN-US Navy 20th Seabee Readiness Group, ALE with TEXAS20SRGIN, also on 4883, 6939.5, 7945.5, 9871.5, and 11504.5; ALE at 1802 (Metcalfe-KY).

14654.5 T57AR1-AR National Guard JISCC, calling SCC43NG (SC National Guard Civil Support Team), ALE at 1522 (Metcalfe-KY).

14800.0 OMFUX-French navy, New Caledonia, calling 20MFUJ, ALE at 0843 (Waters-Australia).

14818.5 XSS-UK Defence High-Frequency Communications Service (DHFCS), ALE sounding at 0556 (Waters-Australia).

14981.7 Unid-Egyptian MFA, Arabic ARQ text traffic to unknown embassy, at 0610 (Waters-Australia).

15010.0 Lajes-USAF, Lajes Field, Azores, attempted patch for Reach 403 (Air Mobility Command), went to 11220 due to weak signal, at 0200 (Metcalfe-KY).

15602.0 9010ORCAP-CAP, OR, ALE sounding at 0100 (MDMonitor-MD).

15999.5 Unid-North Korean ARQ system, encrypted traffic at 0815 (Waters-Australia).

16035.0 9VG252-Kyodo News, Singapore, Japanese news FAX at 0720 (Waters-Australia).

16050.0 FUE-French Navy, Brest, STANAG 4285 marker for group call FAAC, at 0710 (Waters-Australia).

16090.0 JES-Unknown station, ALE and secure voice with BGD, at 1451 (Metcalfe-KY).

16331.7 "D"-Russian CW cluster beacon (MX), at 0724 (Boender-Netherlands).

16331.9 "S"-MX, CW at 0724 (Boender-Netherlands).

16332.0 "C"-MX, Moscow, CW at 0724 (Boender-Netherlands).

16332.1 "A"-MX, Astrakhan, CW at 0724 (Boender-Netherlands).

17412.0 0011ARCAP-CAP, AR, ALE sounding at 2000 (MDMonitor-MD).

19814.0 0011ARCAP-AR CAP, ALE sounding at 0417 (Waters-Australia).

20000.0 WWV-US National Institute of Standards and Technology, CO, standard time and frequency signals at 0417 (Waters-Australia).

25000.0 Unid-Finnish Center for Metrology and Accreditation, Espoo, standard time signals in format used by DCF77, at 1136 (ALF-Germany).

27830.0 UK Community Audio Distribution Services, relay of Sunday Mass from St. Agnes's Catholic Church, Northern Ireland, FM at 1215 (ALF-Germany).

29894.0 0303WACAP-CAP, WA, ALE sounding at 0430 (Hugh Stegman-CA). [Heard June 19 and 20 via sporadic E skip. -Hugh]

Mike Chace
mikechace@monitoringtimes.com
www.chace-ortiz.org/umc

UK Military and Aussie Digital Signals on HF

This month we take a look at some interesting movements in British Forces digital signals that can be heard on HF, in addition to looking further afield at some signals you can hear from Australia.

UK Military 75bd transmissions

In late May to early June this year, a pair of 75bd/850Hz STANAG4481 encrypted RTTY (so-called RATT) signals began to appear in a number of places. This system is a NATO standard and is used by many military organizations around the world for point-to-point or broadcast communication means.

At first, these signals seemed to change channels every few days and sometimes one of the pair would not be active. Using the beam antenna clearly showed that one of the signals was coming from Europe and the other mostly from due south of Digital Towers, my home base. At times, this latter signal also switched direction, arriving from a more southeasterly point.

Enlisting the help of another listener with DF (direction finding) capabilities, one of the signals was pinpointed as originating from the UK Forces transmitter complex at St Eval. Although this listener was not able to hear the signals from the other locations, there are two UK Forces facilities that fit these bearings very well: the Falkland Islands and Ascension Island. The latter for example, is used by the British as a back-up location for the net control station that uses the ALE identifier XSS, which is usually sent from the transmitter complex at Forest Moor.

This map of the Falklands War, from the West Point Military Academy site, shows the locations of Ascension Island and the Falkland Islands.

At present, the signal appears to have settled on 12181.7 kHz as its main channel and the Ascension/Falklands signals are no longer to be found. Here is the complete list of frequencies on which these signals were found:

5811.7, 5814.7, 10386.7, 12181.7, 12415.7, 13495.7, 13676.7, 14355.7, 14379.7, 14407.7, 14461.7, 14512.7, 14551.7, 14871.7, 14876.7, 15804.7, 16038.7, 16130.7, 16189.7, 16341.7, 16560.7, 16616.7 and 18451.7 kHz

MKL MATELO Gone from HF?

One odd coincidence is that the long-established MKL 75bd/850 encrypted MATELO (Maritime Air Telecommunication Organization) transmissions on 23238, 11213, 8988, 6759 and 4732 kHz appear to have ceased around the time that the new signals reported above settled on on regular frequencies. There may be no connection, but the timing is a little suspicious.

Australian Digital Signals on HF

It's not very often that we are able to hear transmissions from "down under," especially with the current poor conditions on HF, but there are a few channels that are regularly audible from Digital Towers. These are mainly heard early to mid-evening Eastern Time and offer the opportunity to copy a number of channels used by the Australian Forces.

Most notable is the use of continuous mode MIL-188-110A HF modem circuits that are usually sent as an ISB (Independent Side Band) pair. Remember that if you have an ISB signal properly tuned, it will sound the same, regardless whether you select USB or LSB on your receiver. These links are most often heard idling and sometimes only the upper sideband signal is active.

Other commonly heard Australian signals are high speed versions of the usually 75bd/850 STANAG4481 FSK RTTY signals operated by many NATO organizations. The Aussies are fairly unique in that they make use of both 300bd/300Hz shift and even 600bd/600Hz shift versions of the same system. Both of these signals are quite distinctive when you hear them, especially when they change to a brief period of reversals (10101010...) between messages. Here are some recently heard channels for you to try:

8225.00	MIL-188-110A HF modem, 2 channels continuous mode idle (on ISB)
8560.00	MIL-188-110A HF Modem, 2 channels continuous traffic (on ISB)
9056.00	MIL-188-110A HF modem, continuous traffic (on USB)
9100.00	MIL-188-110A HF modem, continuous mode idle (on USB)
9159.00	MIL-188-110A HF modem, continuous mode traffic (on USB)
10166.86	300bd/300 STANAG4481 FSK, KG84 crypto
10368.00	MIL-188-110A HF modem, continuous traffic (on USB)
10369.35	600bd/600 STANAG4481 FSK, KG84 crypto
10408.36	600bd/600 STANAG4481 FSK, KG84 crypto
10423.00	MIL-188-110A HF modem, continuous mode traffic (on USB)
10440.00	MIL-188-110A HF modem, 2 channels continuous mode traffic (on ISB)
10513.00	MIL-188-110A HF modem, continuous mode traffic (on USB)
10516.00	MIL-188-110A HF Modem, 2 channels continuous traffic (on ISB)
10595.00	MIL-188-110A HF modem, continuous traffic (on USB)
10826.35	300bd/300 STANAG4481 FSK, KG84 crypto
10826.36	600bd/600 STANAG4481 FSK, KG84 crypto
10862.00	MIL-188-110A HF modem, continuous traffic (on USB)
10931.50	600bd/600 STANAG4481 FSK, KG84 crypto
10958.00	MIL-188-110A HF modem, continuous traffic (on USB)
10965.00	MIL-188-110A HF modem, 2 channels continuous mode traffic in idle (on ISB)
11157.50	300bd/300 STANAG4481 FSK, KG84 crypto
11442.50	300bd/300 STANAG4481 FSK, KG84 crypto
11442.50	600bd/600 STANAG4481 FSK, KG84 crypto
12230.00	MIL-188-110A HF modem, continuous mode traffic (on USB)
13416.00	MIL-188-110A HF modem, continuous mode traffic (on USB)
13440.00	MIL-188-110A HF modem, continuous mode traffic (on USB)
13478.50	600bd/600 STANAG4481 FSK, KG84 crypto
13525.00	MIL-188-110A HF Modem, 2 channels continuous traffic idle (on ISB)
13590.00	MIL-188-110A HF modem, continuous mode in idle, 2 channels (on ISB)
14520.00	MIL-188-110A HF modem, continuous mode idle (on USB)
14601.46	600bd/600 STANAG4481 FSK, KG84 crypto
14684.00	MIL-188-110A HF modem, continuous mode idle (on USB)
14913.00	MIL-188-110A HF modem, 2 channels continuous mode in idle (on ISB)
15696.00	MIL-188-110A HF modem, continuous mode traffic (on USB)
15746.50	MIL-188-110A HF modem, continuous mode traffic (on USB)
16580.00	MIL-188-110A HF modem, continuous mode traffic (on USB)
17003.35	600bd/600 STANAG4481 FSK, KG84 crypto
17036.00	600bd/600 STANAG4481 FSK, KG84 crypto
17125.00	MIL-188-110A HF modem, 2 channels continuous mode traffic (on ISB)
17407.00	MIL-188-110A HF modem, continuous mode traffic (on USB)

That's all for this month. Enjoy your digital listening and feel free to write or email with your ideas for future columns and whatever questions you have about digital utility listening.

RESOURCES

St Eval Transmitter Complex (on Google Maps)
maps.google.com/maps?ll=50.477954,-4.999048&spn=0.003076,0.008256&t=h&z=18

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

T.J. "Skip" Arey, N2EI
tjarey@monitoringtimes.com

Back to School

As you know, there is an unavoidable "Time Shift" between when I write this column and when it arrives in your mailbox. Nonetheless, as I put this column into the word processor, I am already seeing signs in the local stores proclaiming "Back to School Sale!" I find this amusing, because I would be surprised if the kids in the neighborhood have even received their Summer Reading List yet.

From Grade School to Graduate School, I spent well over half my life looking toward what September would bring. With that seasonal patterning so deeply ingrained, I wouldn't be surprised if other hams feel the urge to crack a few books once the first leaves on the trees begin to turn.

One of the things that keeps our hobby vital is that there are always new things to learn. While it may seem, from my personal operating style, that I am stuck in the first half of the last century, wishing for the return of Spark Gap, the truth is that I work very hard to keep up to date with amateur radio skills and developments. Although I use the words "work" and "hard," for me, it is neither. I enjoy every minute of learning new ham radio stuff. In this month's column, I hope to convince you folks to metaphorically climb on the big yellow bus once again and learn something new. Let's all head back to ham radio school. Maybe we can take a few electives to go along with our amateur radio major.

❖ Time to Upgrade

Well, I may as well start out with the obvious. Upgrading from the entry level Technician Class amateur radio license all the way up through Extra Class has never been easier. Study materials by organizations such as The American Radio Relay League **www.arrl.org**, W5YI www.w5yi.org and supportive Web sites such as **www.radioexam.org** make ham exam preparation easy as pie (or is that **π** ?).

It has been a while since Old Uncle Skip has had to sit for an FCC Exam, but I have regularly reviewed the study materials and remain a credentialed Volunteer Examiner (VE). If you are a person with reasonable study skills and a bit of self discipline, a few hours' study each night for about a month should put you in the position to sit for your next highest exam. Given that most Volunteer test Sessions are run once a month, a tenacious person can work his or her way up to amateur radio's "Black Belt," the Extra Class ticket, in as little as three months, starting from scratch. With the basic code requirement no longer part of the program, you can put all your energy into learning the theory.

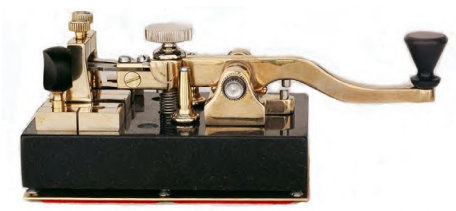
A word of caution: Yes it is possible to "memorize" enough of the correct answers on any of the license question pools to squeeze your way through the examination process. This has been the case for many years. That said, you may pass the test, but your lack of amateur radio knowledge will become apparent the first time you key your mic. Do yourself and your fellow hams a favor. Make the extra effort to understand what those answers mean. You'll be a better ham, and I guarantee you will enjoy the hobby all the more.

❖ Learn the Code

Aha! You thought you were going to get out of this without me bringing up the "CW" word. You folks should know me better by now. While Morse code sending and receiving are no longer part of the requirements to become a licensed radio amateur, CW is still a viable mode with amazing abilities. A lot of fear was built up around the code in years past because it was seen as a barrier to access to ham radio. All too many folks just learned the code well enough to get over that particular exam element without ever really trying things out on the air.

"No Code" folks are full hams with all the rights and privileges appertained thereunto, but they miss out on a way of communicating that is at the very roots of radio, going all the way back to Marconi.

I've said this many times, but I'll repeat myself: Learning CW is just not that hard. Find yourself an online code training tool such as Sigurd Stenersen LB2KB's "Just Learn Morse Code" **www.justlearnmorsecode.com/**. If you want to kick it Old School, check with some older hams in your area to see if they have any code tapes or CDs. Commit yourself to learning one or two characters per day. In a little over a month's time, you will have all you need to monitor CW transmissions on the air. Once you are comfortable receiving, look up the CW portions of the bands your current license covers and send out a CQ at any speed you are comfortable with. You'll be running with the A-1 Ops before you know it!



❖ Learn a New Mode

This is where I get to put on my "Old Guy" hat and say: "We had it hard back in the old days. All we had was CW, AM Phone, Baudot RTTY and this new fangled Single Side Band."

Well, that is a bit of an exaggeration. We also had FAX and some folks were playing around with Slow Scan TV.

Once the FCC allowed hams to start playing with ASCII RTTY, the digital floodgates opened and dozens of ways of communicating with one another came into being. Add to those text based systems digital voice and you will be hard pressed to find any one ham playing with all the modes on all the bands. I am fairly sure you would have to hit the Lottery to afford all the gear.

Or would you? The neat thing about most of the newer digital modes is that they can all be made to run using a personal computer, sound card and a simple interface to a transceiver. So, if you are already set up to play with PSK31, for example, a bit of a shift in software will get you into the world of packet radio, MFSK, Hellschreiber, MT63… the list goes on and on.

If the digital text based modes don't float your boat, you might want to look into Amateur Television. ATV used to be extremely exotic because of the expense of video equipment. The home VCR market changed all that, putting good quality cameras into ham hands at reasonable prices. Building an ATV setup is not any more expensive than setting up a contest quality VHF/UHF system. In amateur radio, moving out of your comfort zone can be a lot of fun.

❖ Hands On Learning

To put it bluntly: *Don't just sit there, build something*!

There is no better way to master our hobby than to melt solder. A quick search around the Internet or a cursory glance at the back pages of any of the amateur radio oriented monthly publications will turn up dozens of ham radio kits for all skill levels. You can build anything from that simple digital interface I mentioned above to full-fledged transceivers. You can also pick a schematic out of a book and assemble it.

Now comes the big secret to building electronics projects: Sometimes they don't work when you are done. And guess what? *That's when the learning begins!* Machines can put a

bunch of parts on a PC board. It takes a tenacious ham to figure out how to bring a dormant circuit to life.

Old Uncle Skip has been building kits for over 30 years. The ones I really remember best are the ones that didn't light up the first time I applied power to them. When I got lost, I could always find an "Elmer" to help me with the troubleshooting. Now, almost any kit or project you will run across probably has a support group somewhere on the Internet. There are dozens of folks standing ready to help point you to the problem and how to fix it.

❖ Read Any Good Books Lately?

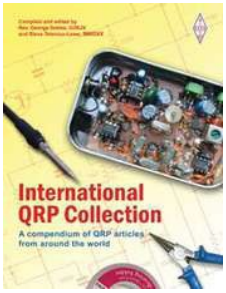
Most hobbies have some number of books written to help you get started and then improve upon that base of learning as your interest grows. Amateur radio is no exception. (I should point out that many of the folks found in the pages of *MT* have contributed to this library of ham radio learning over the years.). If you look at the publications pages of such magazines as QST **www.arrl.org** or CQ **www.cq-amateur-radio.com** you are sure to find a book or two that will grow your ham radio knowledge base. I have reviewed countless radio hobby books over the years and I can honestly say that I never found one that did not justify its cover price in terms of new knowledge imparted.

Maybe you are interested in taking my abovementioned advice to learn a new mode. A great place to start is to find a book on that particular mode of operation. You will not only come to understand the mode, you will also avoid making mistakes in terms of setting up and purchasing the necessary gear to move into that type of operating. If a $15 book saves you a couple of hundred dollars when looking to buy a new radio, I think that is a great return on investment.

❖ Book of the Month

I have been a bit remiss in letting you folks know about good ham radio reading of late. Allow me to make amends by sharing one of my new favorites.

THE INTERNATIONAL QRP COLLECTION
Compiled and edited by Rev. George Dobbs G3RJV and Steve Telenius-Lowe (m6DXX
Published by the Radio Society of Great Britain RSGB
$24.95 (US Price) 176 Pages
ISBN: 9781-9050-8655-9
Available in the U.S. from
The American Radio Relay League
225 Main Street
Newington, CT 06111-1494
www.arrl.org/shop
1-888-277-5289



For me, this is a very dangerous book. This kind of book can send me to my basement workshop for many hours. (There is no truth to the rumor that I have been treated for recurring basement mold! However, putting a book like this in my hands can get such rumors started for certain.)

The Rev. George Dobbs G3RJV is a long time fixture in the QRP community. He has pioneered simple home brewed circuitry in the same way the late great Doug DeMaw W1FB did on this side of the Atlantic. With his co-author Steve 9M6DXX, he has complied a collection of great ham radio hobby projects from such publications as *RadCom, QST, SPART, Practical Wireless, The Canadian Amateur, Lo-Key* and *Break In*. Many of the designs presented come from the current masters of the home built radio world, including such luminaries as Steve "Melt Solder" Weber KD1JV, Steve Ford WB8IMY, Rick Campbell KK7B, Wes Hayward W7ZOI and, of course, the Rev. George Dobbs G3RJV himself. So, what you have is a collection of what amounts to the best of the best low power ham radio projects, edited by two of the top folks in the hobby today.

Since all of the circuits in this book have been previously published, I have had the opportunity to put a few of them together. I have had many hours of fun playing with these designs along the lines of what I mentioned above. Building radios is a great way to learn more about radio.

If you are new to home building from the bottom up, you will be hard pressed to find a better design to start with than Wes W7ZOI's Universal QRP Transmitter found on page 64 of this excellent book. I cannot recommend this book too highly for folks who enjoy home building or who want to get started in home building.

The great thing about our hobby is that there is always something new and exciting to learn. Have fun! I'll see you at the bottom end of 40 meters.

❖ Learn A New Skill

As hams, we are at our best when we serve our communities. It is the rent we pay for the bands we use. Within the amateur radio community, there are opportunities to advance your value to your community through coursework in specific emergency services. Check with your local ham clubs, ARES or Emergency Management offices for classes pertinent to hams. If the SKYWARN organization **www.skywarn.org/** is active in your area, they also hold classes on how hams can support the community.

Opportunities exist outside of amateur radio organizations as well. For example, you might want to look into taking CPR or basic First Aid classes. My ham radio interests led me to take the classes to become and Emergency Medical Technician (EMT) and a member of the Community Emergency Response Team (CERT) Program.

Let me toss out one more idea. When hams first started playing with personal computers (we were some of the first folks doing that) I took a few basic computer courses at my local community college. That basic knowledge still influences my ham radio practices. Community colleges and other community based education can be very inexpensive and fulfilling. Maybe you might want to find a class in conversational Spanish. It might increase your DX station totals. Of course, you might actually find some good classes in basic electronics. More than a few folks leveraged their ham radio activities into full blown Electrical Engineering degrees.

Any and all of the above ideas are ways you can grow in your amateur radio knowledge and skill. There is nothing in the world more invigorating and energizing than learning something new.

GETTING STARTED

THE BEGINNER'S CORNER

Ken Reitz, KS4ZR
kenreitz@monitoringtimes.com

Field Day 2010 Report and Hooked on HF Pirates

Field Day 2010 was typical of the previous ten years for me: hot and sticky. It was 90 plus degrees in the shade with hardly a breath of air stirring, a pall of humidity in the air, and an exploding population of ticks and chiggers, drooling at the rumor that I would soon be thrashing around the woods in search of a suitable Field Day site.

But, first I had to find my trusty Field Day antenna: a random-length dipole, fed with ladder line that was usually in the radio closet. Then I remembered. I had tossed it out in a cleaning frenzy last winter. "I'll put together a better antenna anyway," I promised myself at that time, snow piled up on the ground, temperatures outside rarely getting out of the 20s. Field Day seemed so far away.

Now, all of a sudden, it was Field Day. It was hot, my antenna was missing, thunderstorms were predicted, it was already 1800Z, and I knew that hundreds of thousands of hams across the U.S. were already racking up the contacts. I went to the garage to dig out the lawn tractor battery. My digital voltmeter confirmed my earlier fears: dead as my chances of getting on the air that day. Then the doubts really crept in and I began to have second thoughts about even trying.

Still, I put the charger on the battery and set about to get a station on the air. Within half an hour I had dragged out my old Uniden 2510 10 meter rig and a CB antenna I found in the garage. Finding a small power supply and an extension cord I set up in the shade. But, where to put the antenna?

KS4ZR Field Day 2010 operating position. As the ice quickly melts in the 90+ temperature I wondered, "Would 10 watts and a 20' section of rain gutter 10 feet off the ground be enough to be heard?" The iced tea really helped.

Back to the garage where I found a heavy, 6 foot tall, tree planting bar that I drove into the ground about eight inches. Placing the magmount CB antenna on top and hooking it up to the 2510, I started tuning around. The band was quite open, at least to the south, with quite a few stations calling "CQ Field Day." In a few minutes I worked stations in Georgia and Florida, but realized I'd need more bands than just 10 meters to make a successful Field Day.

❖ Double Duty Antenna

I went back into the house, retrieved my Kenwood TS-140s transceiver, a table, chair and an MFJ antenna tuner. With the table on the deck in front of the house (and in the shade!), I started to put the station together. But, there was still a problem. I couldn't use the CB magmount for anything except 10 meters. I needed an all-band antenna, but after rummaging through the wire drawer, nothing seemed to fit the bill.

Then I seemed to hear the voice of Bob Grove echoing in my head. I thought, "My brain must be melting in the heat." I realized I was just remembering what he had written in an earlier article in his series *All About Antennas*. What was it? Ah yes, from the July issue: "Resourceful hams, SWLs and scanning enthusiasts have often resorted to make-do antennas. Bed springs, filing cabinets, rain gutters and downspouts, aluminum window frames…"

Wait a minute! I had set the table up right next to a downspout and it happened there was an eight foot ground rod right next to it! The downspout went up to a twenty foot long section of rain gutter, but it was only 8 feet above the deck and 10 feet above ground. Were my antenna troubles over? Or would I have to resort to bed springs?

The answer would have to wait, because first I had to make up a set of lead-in cables to attach the rain gutter and ground rod to the antenna tuner. Back inside to the wire drawer. Hmmm, that air-conditioned air feels better every time I come into the house!

What's this? I found two test leads for my analog multi-meter with alligator clips on one end and a nice steel pin on the other. But, the leads were a little thin. Would they take the RF I was about to put through them? And, if so, how efficient would the transfer be? And, how would the lizards living in the downspout react to getting juiced?

I had to move the table precariously close to the edge of the deck to make the cable reach. Clipping one end of each of the cables to downspout and ground rod, I secured the other ends into the terminal screws meant for wire antenna lead on the tuner. It was time for the moment of truth. But first, I realized that it was probably not a good idea to run the rig's normal 100 watts through this flimsy set-up. Better crank the wattage down to 10 watts and see how it goes. Besides, hooked up to the lawn tractor battery, lower power would let the battery last a lot longer.

I set the tuner to dummy load and the transmitter output to 10 watts. Next, I set the tuner to the Bal/Wire position and the rig to the 15 meter band. The speaker jumped to life with strong signals. Tuning to an unused frequency in CW mode, I selected an inductor position on the tuner that made the band noise loudest, adjusted the transmitter matching coil for further increase in band noise, and keyed the transmitter. It loaded beautifully. Just a little twist on the matching knob and the SWR meter showed a 1:1 match at 10 watts.

From my location in central Virginia, I trolled up the band and worked stations in Missouri, Michigan, Indiana and Wisconsin before switching to 10 meters. With slight adjustments it worked well here, too, and 10 was still wide open. I worked stations in Georgia, Minnesota, and Missouri. Back to 15 meters, I bagged South Carolina, Ohio, Illinois, Kentucky, and Mississippi.

The gutters had a tougher time loading on 20 meters. Still, I worked stations in Colorado, Nebraska, Louisiana and Wyoming.

The biggest problem was 80 and 40 meters. That late in the day the atmospheric noise was really building on those bands, the gutters were tough to load, and the minimal power made contact on those bands impossible.

Still, working only 20, 15 and 10 meters over a five hour period during Saturday and Sunday of Field Day, I made 40 contacts working stations in 23 states and one province with the greatest distance being 1,500 miles. Not bad for 10 watts and a short rain gutter. I could have contacted many more times that a number, but I was chasing states and trying not to work duplicates. This set-up was a power miser too, because a few days later the lawn tractor cranked right up!

It should be noted that one reason for the success of such an improvised antenna was that all the stations with which I had contact were

doing all the heavy lifting. They had booming signals, beam antennas, and sensitive receivers. If every station operating during Field Day used the same set up I did, I may not have made more than a handful of contacts. Even so, I've been encouraged to try a similar thing next year. Maybe I'll load up the basketball goal support or some large aluminum framed windows. Of course, there's always the bed springs!

❖ Hooked on HF Pirates

In the lead-up to the feature article I wrote for the July issue of *MT*, titled "*Radio Pirates: The Intriguing World of Unlicensed Broadcasters*," nightly stalking of the frequencies between 6 and 7 MHz has netted a lot of pirate activity. While listening during the spring was easy, the summer months and heavy static crashes from seasonal thunderstorms have made listening a lot harder. Still, they're out there, on the air; you just have to dig a little harder to find them.

Being new to the pirate band, I found that Andrew Yoder's 2010 *Pirate Radio Annual* (reviewed in the August *Beginner's Corner*) has proved a most valuable resource. It's a way to get up to speed quickly on this niche spectrum monitoring. One station that, according to Yoder, is a mystery within this mysterious band, is Wolverine Radio.

Wolverine Radio

Transmitting randomly in the evenings, their hour-long set has a further puzzle within its transmission. For example, one evening in June the broadcast featured twenty six songs of various lengths by various artists in various genres. It wasn't until more than half-way through the set that I recognized that they were going through the alphabet with each song chosen. After the song starting with the letter z, the station IDed one last time and ended with an SSTV image. Each broadcast is a different theme and some are quite tricky to decipher.

Another distinguishing trait is their sign-on theme song which, according to Yoder, is "Testing 1,2,3" by Barenaked Ladies (I've not been around the frequency, 6.925 MHz, when they sign on). They also end their transmissions with a slow-scan TV image sent via standard Scottie 1 SSTV used by hams. The image is usually related to the musical theme for the night.

To capture the image, have your SSTV program such as MMSSTV (**http://mmhamsoft.amateur-radio.ca/**) ready and a patch cord from the speaker of your radio to the microphone input of your computer's sound card. When you hear the distinctive sounds of the SSTV image transmission, push the plug in and set the volume so that it doesn't overdrive the mic input. If you missed the image (it's only sent once), you can visit the Grapevine on Free Radio Net (**www.frn.net/vines/**). Usually someone a little quicker on the draw will have copied the image and it can be seen there.

The SSTV image on this page was on an unusually cool summer night with virtually no atmospheric noise, hence the nearly flawless image capture. According to Yoder, Wolverine Radio doesn't QSL via e-mail, snail mail, or even postings on FRN's web site – an unusual

policy. So, if you can catch the SSTV image it's likely to be the only QSL you'll get from this mysterious HF pirate. But, that really ought to be good enough.

WBNY Relays

Another curiosity of the HF pirate band is the WBNY relay network. Just as Radio Canada International relays brokered shortwave programming from stations harder to hear in North America (such as Radio Japan), the WBNY relay network provides a platform for pirate programmers whose audience would otherwise not be reached.

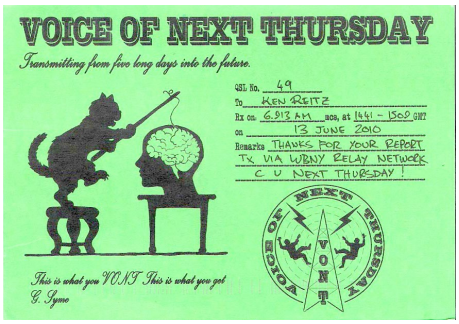
For instance, the Voice of Next Thursday (VONT) apparently originates in Australia but is heard on the WBNY relay. The QSL (pictured) is sent both via e-mail and actual snail mail. This card had not only an Australian postage stamp in the proper place but a VONT stamp in place of a return address. The VONT stamp (enlarged) shows a 1940s-dressed woman at a desk in front of a microphone; the image of a person falling is seen in the background (part of VONT's logo), a large 73s is just under Voice of Next Thursday. The announcer claims to be G. Syme, broadcasting from "five days into the future."

Voice of Next Thursday stamp. Note falling man logo in background.

Radio Ronin Shortwave issues some of the most interesting QSL cards. The one pictured here notes "Radio Ronin Shortwave via The Fat Man," a reference to the inaugural use of their

new high power transmitter dubbed The Fat Man, depicted on the QSL as a Sumo wrestler. To commemorate the occasion, Radio Ronin Shortwave issued a limited edition, numbered QSL. The one pictured is number 4 of 20 issued. The station would not divulge exactly what the power output of The Fat Man is, but judging from its 5/9 + 10 dB AM signal, it's got to be in the kilowatt range.

Regular monitoring of the pirate band will net a dozen or more stations over the course of a week, more on weekends and holidays, depending on your location. East Coast listeners will have a much better shot, particularly during poor band conditions, of tuning in. The transmissions, of course, are unannounced, but if you check the FRN web site under the category PX Announcements, you may be tipped off to future important broadcasts.



HF pirate radio QSLs from Radio Ronin Shortwave and The Voice of Next Thursday.

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

Fred Waterer
fredwaterer@monitoringtimes.com
www.doghousecharlie.com/radio

The Magic of Radio

Every once in a while, Radio reminds one of what a magical medium it can be. I am a fan of a number of podcasts from around the world. I download a regular roster of these via the iTunes program on my computer and then listen to them (or not ... it's my choice) at my leisure.

One such program that I download and listen to each week is the Canadian Broadcasting Corporation's ***Tapestry***, a program about faith and spiritual matters. It's usually an interesting discussion, mainly because of the interviewer Mary Hynes, who asks the questions and then lets her guests do the talking. In other words, it's not about her, it's all about the guests.

Recently, I was downloading podcasts, absentmindedly watching the titles of the programs as they started to download. Suddenly a very familiar name from a long time ago jumped out at me and I rushed to listen to the program. The guest was a theologian who had written a book, and as I listened to him talk about his life's journey, I realized that, sure enough, he was the same Arthur Boers who had lived across the street from me when I was 7 or 8 years old!

With a couple of clicks on Google, I found an email address for him at a university in Toronto, which in turn led to an exchange of emails back and forth in which we shared a wealth of childhood memories and caught up on our own life paths. That episode of ***Tapestry*** is certainly one that this listener will never forget!

❖ Local Radio Goes Worldwide

Talk radio in general is one of those genres that one either loves or hates. So many programs are either political (both right and left) or all about the opinions of the host, not the listeners. This is mostly true of nationally syndicated talk shows, and to some extent of local programming as well. Sometimes though, local talk is the most entertaining and thought provoking of all.

One benefit of so much radio being available via the World Wide Web is that people have access to local programming from all over the world. Just a few years ago, a local show in Toronto, or Buffalo, or Perth could only be heard as far as their transmitters could reach. Now, in our connected world, listeners in Toronto can just as easily hear Perth, Australia as their own city. Here are three such local programs that are well worth hearing.

Dear Reader, may I let you in on a little secret? For years, I have been having a lunchtime

rendezvous with a married woman. OK, she's on the radio, and she doesn't really know me. Still, from noon to 1pm every weekday, one can hear ***Ontario Today*** on the CBC Radio One, hosted by Rita Celli.

For many years this was a two-hour show (noon-2); however, in the last re-organization of the CBC Radio One schedule, local programming all across the country was cut back. Rita has hosted the program for many years. She started in radio in Sudbury, Ontario, before moving to Ottawa in 1994. From studios in the nation's capital, Rita covers the topical, the mundane, the serious and the frivolous with equal professionalism and enthusiasm. There is a regular roster of scheduled guests who take questions: for instance, Ed Lawrence tackles gardening questions every Monday. (Ed is a natural communicator and makes for a very interesting discussion, even if one does not have a "green thumb".) During election campaigns in the province of Ontario, this program is often one of the only opportunities for politicians to reach the entire province at once.

As long as they stick to the topic, Rita allows the callers and guests to dictate where the show goes; it's not about her. When she does jump in, it's always thoughtful and insightful. And due to the Internet, one can hear the show anywhere in the world. Missed a show? Never fear. There is an archive of recent audio at the website. **www.cbc.ca/ontariotoday/index.html**

Speaking of Perth, Australia, there are two really great programs from "Downunder" that are well worth hearing. In Perth, 6PR is a news/talk station. Their overnight program from midnight to 5am is one of the best there is. Hosted by Chris Ilsley weekdays and Jon Lewis on weekends, it is a laid back program, talking about whatever the callers bring up. It's just people talking in the night. The quirky thing is, because of the time zone difference, it's exactly 12 hours ahead of the local Eastern Time Zone in North America. So when he says it's 10 past 3, it's 10 past 3 here, too. Jon Lewis especially likes to take calls from listeners on the web, which he refers to as "JIMs" (Jon's Internet Mates). Listen at 1600 UTC at **www.6pr.com.au**

Over on the other side of Australia, on 3AW in Melbourne, ***The Overnighters*** with Keith McGowan is a hoot. First impressions are that he is kind of gruff, but he's very funny and entertaining, having fun with his listeners in the late night hours there, many of whom are older, regular callers. Keith comes on at 1400 UTC at **www.3aw.com.au** Keith also has a personal website at **www.overnighters.com.au/** Keith plays more music than the fellows at 6PR. Both shows are very entertaining, and give one a window into what the average Australian night owl is up to.

❖ Children's Programming?

Climbing onto a soapbox, why is there so little radio programming for children? In North America, there is almost nothing on the air specifically for children. Maybe once a year, a radio station will have "Santa Claus" drop by to take calls from children, but other than that, nothing.

Nada. Zilch. Or are there? Do you know of any programs on the radio for children? Let us know at the email on the column masthead.

For many years there was a lovely lady in Toronto (I believe) who hosted a program called ***A Visit with Mrs. G***, in which she told Bible stories for children. It is still heard on WWCR, UTC Sundays at 1115 on 15825 kHz; UTC Mondays at 1830, also on 15825 kHz; and Saturdays at 0945 UTC on 9985 kHz. You can check out her website at **www.biblestoriesaliveministries.org/**

BBC Radio 7 devotes several hours per day to programming for children. Each morning there is usually a classic children's story, such as *Pippi Longstocking*, or *Around the World in Eighty Days*, at 5am local. This is followed by two hours of Cbeebies, a program block of fun and games for the younger set. It features games and lots of stories. The website makes it interactive as well.

Weekday afternoons at 4pm local on BBC 7 one can hear ***Big Toe Books***, again featuring stories and serials designed to appeal to the young. These can then be heard for seven days after broadcast. There is also a weekly "Best of" Cbeebies podcast. **www.bbc.co.uk/podcasts**. Listen on demand at **www.bbc.co.uk/radio7** and click Schedules.

Cbeebies has its own website at: **www.bbc.co.uk/cbeebies/**

RTE in Ireland does the BBC one better. They have a whole channel devoted to children,

called **RTE Junior**. "RTÉ Junior is Ireland's first kids-only radio station. Aimed at children aged 2 to 12 years, RTÉ Junior is programmed around a child's day and features pop, rock and classical music as well as nursery rhymes and stories. RTÉ Junior aims to be a safe and entertaining adultfree zone. A radio station that is just for kids but fun for all ages." (RTE Junior website)

A typical day on RTE Junior includes:

7am ***Wakey Wakey!*** Wake up to RTE Junior from birdsong to your favorite song.
8am ***Junior Summer*** Good Morning songs and stories for summer
11am ***Klassical Kids*** Ian Mc Glynn presents the best of Classical Music - Just for Kids
Noon ***Summer Club*** Midday madness with cool sounds of summer with Colm Flynn!
1pm ***Dib Dab Doo*** Summer sounds of Dib Dab Doo - on Junior for you.
6pm ***Klassical Kids***
7pm ***Junior Pyjama***. It's bedtime for some on RTE Junior ! Stories, music and lullabies on Junior Pyjama
8pm ***Not so Junior***. Your Radio Station - just for 10 - 12 year olds. Favorites, pop and classics.

www.digitalradio.ie/rteclone/program-schedule.php?id=3&day=2010-07-15

It's great that RTE has this service for youngsters. It sounds like something that parents of young children could leave on all day if they wish and never worry about what the children were listening to.

Radio New Zealand has not forgotten the children in their program schedule, either. On local Saturday and Sunday mornings at 6am (1800 UTC Friday and Saturday), Radio New Zealand National presents ***Storytime***. "The drama department commissions new writing and seeks to work with New Zealand's best writers.

"Each year, up to 30 hours of new drama and comedy more than 200 readings (one-off short stories and serialised book readings), and over 50 new children's stories are produced." **www.radionz.co.nz/national/drama/dramainfo/storytime**

❖ Fred's Pick

Deutsche Welle - Hits in Germany

Hits in Germany is one of my favorite music programs from an international broadcaster. Each week, Deborah Freedman presents a half hour on what's new and trendy on the music scene in Germany. Occasionally, she presents a "themed" show, such as Elvis Presley's German influences and imitators (on the anniversary of his death), or German entries to the Eurovision Song Contest.

A few years ago, in response to an email sent to the program, Producer Rick Fulker commented, "…we make an effort to have seven titles from the German top 100 each week, with five of them being either German-language or produced in Germany. That wouldn't have been possible a few years ago, but these productions have really become more numerous and increasingly important internationally."

The great thing about this approach is that listeners on this side of the Atlantic hear a lot of tunes and bands that, sadly, just aren't played in North America. Which is a shame because there is some fantastic music produced in Germany and other parts of Europe.

Hits in Germany can be heard via the DW website on UTC Mondays and Tuesdays. You can also try DW on shortwave on UTC Mondays at 2130 UTC on 9735, 11865 or 15640 kHz, beamed to Africa.

❖ What's New

KBS World Radio - *Happy Cooking and Healthy Living*

This seems to be a new program via KBS World Radio in Seoul. It is heard in the last fifteen minutes of UTC Wednesday KBS broadcasts.

As befits a radio program in the 21st century, one can listen to several past episodes via the pop-up player on the KBS website. The most recent edition, as this column was prepared, featured a chicken dish called Chogyetang. (Judging by the ingredients, this dish puts the tang in Chogyetang.)

But wait! You didn't really have time to copy down the details of the recipe? No problem! There is a detailed recipe with step-by-step instructions, with each step illustrated by a photograph! Food Network, eat your heart out! Just click the ***Happy Cooking and Healthy Living*** link on the left hand side of the KBS website at: **http://world.kbs.co.kr/english/**

❖ Coming in September

Mark Lamar's Shake Rattle and Roll

In September, Mark LaMarr returns with another 13-week series of his ***Shake Rattle and Roll*** program, one of the better programs of its kind, anywhere. The program can be heard on BBC Radio 2 in the UK, and via the BBC Radio 2 website for the rest of us, across the world.

Although a relatively young man, LaMarr has an encyclopaedic knowledge of the music of the early Rock and Roll era, including Rockabilly, Rhythm and Blues, and Country Swing. Coupled with his enormous collection of records and CDs, it makes for a program that never disappoints. He tends towards the more obscure songs, B sides, and album cuts, rather than the typical hits one can hear anywhere at any time.

Each program is crammed with an incredibly diverse cross section of the music of the early rock and roll era, and coupled with Mark's quirky sense of humour and intimate knowledge of the music, it all comes together as a very entertaining, toe tapping hour of listening. The BBC Radio 2 website also displays a track list for each program in the seven days following the broadcast. Like most BBC programs it can also be heard on demand for seven days as well. Traditionally, the final episode of each series is dedicated exclusively to listener's requests.

One can hear ***Shake Rattle and Roll*** on BBC Radio 2. Check the website at the beginning of September at **www.bbc.co.uk/radio2**

Mr. Trololo

In 2010, a video featuring Russian singer Eduard Hill went viral on youtube, with literally millions of hits. It is a silly sappy song (so bad it's good), featuring a 1976 video of a vocalised version of the song, "I Am Glad I'm Finally Going Home" (Я очень рад, ведь я, наконец, возвращаюсь домой). The Voice of Russia website has jumped on the bandwagon this summer, participating in a "worldwide contest" to put words to the song.

"The work is to come as an electronic text message sent to the following address: *trololo@ruvr.ru*. The letter must contain the author's full name, the country and city of residence, the email address and telephone numbers. The evaluation criteria are an interesting creative approach to the interpretation of the topic, the choice of the topic and literary style… The best verses written in different languages will make one song, a kind of the Earth's Anthem."

The Earth's Anthem?! Oh well, that's just as over the top as the song itself. The results of this effort should be known by the time you read this. It's all terribly amusing.

How to Use the Shortwave Guide

Convert your time to UTC.

Broadcast time on ① and time off ② are expressed in Coordinated Universal Time (UTC) – the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Standard Time) 5, 6, 7 or 8 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

Note that all *dates*, as well as times, are in UTC; for example, a show which might air at 0030 UTC *Sunday* will be heard on *Saturday* evening in America (in other words, 7:30 pm Eastern, 6:30 pm Central, etc.).

Find the station you want to hear.

Look at the page which corresponds to the time you will be listening. English broadcasts are listed by UTC time on ① , then alphabetically by country ③, followed by the station name ④. (If the station name is the same as the country, we don't repeat it, e.g., "Vanuatu, Radio" [Vanuatu].)

If a broadcast is not *daily*, the days of broadcast ⑤ will appear in the column following the time of broadcast, using the following codes:

Codes	
s/Sun	Sunday
m/Mon	Monday
t	Tuesday
w	Wednesday
h	Thursday
f	Friday
a/Sat	Saturday
occ:	occasional
DRM:	Digital Radio Mondiale
irreg	Irregular broadcasts
vl	Various languages
USB:	Upper Sideband

Choose the most promising frequencies for the time, location and conditions.

The frequencies ⑥ follow to the right of the station listing; all frequencies are listed in kilohertz (kHz). Not all listed stations will be heard from your location and virtually none of them will be heard all the time on all frequencies.

Shortwave broadcast stations change some of their frequencies at least twice a year, in April and October, to adapt to seasonal conditions. But they can also change in response to short-term conditions, interference, equipment problems, etc. Our frequency manager coordinates published station schedules with confirmations and reports from her monitoring team and *MT* readers to make the Shortwave Guide up-to-date as of one week before print deadline.

To help you find the most promising signal for your location, immediately following each frequency we've included information on the target area ⑦ of the broadcast. Signals beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible.

Target Areas
- af: Africa
- al: alternate frequency (occasional use only)
- am: The Americas
- as: Asia
- ca: Central America
- do: domestic broadcast
- eu: Europe
- me: Middle East
- na: North America
- pa: Pacific
- sa: South America
- va: various

Mode used by all stations in this guide is AM unless otherwise indicated.

MT MONITORING TEAM

Gayle Van Horn
Frequency Manager
gaylevanhorn@monitoringtimes.com

Larry Van Horn, MT Asst. Editor
larryvanhorn@monitoringtimes.com

Additional Contributors to This Month's Shortwave Guide:

Thank You to …

BCL News; DX Asia; British DX Club; Cumbre DX; DSWCI-DX Window, Hard-Core DX; Radio Bulgaria DX Mix News; Media Broadcast, Play DX; WWDXC-BC DX-Top News; World DX Club/Contact, PTSW; World Radio TV Handbook.

Alokesh Gupta, New Delhi, India; Mike Barraclough, UK; Ivo Ivanov; Bulgaria; Sean Gilbert, UK; Rachel Baughn/MT; Ron Howard, CA; Frank Klimek, Colby, WI; Hans Johnson; Rich D' Angelo/ NASWA-Flash Sheet, NASWA-Journal; Tom Taylor, UK.

Shortwave Broadcast Bands

kHz	Meters
2300-2495	120 meters (Note 1)
3200-3400	90 meters (Note 1)
3900-3950	75 meters (Regional band, used for broadcasting in Asia only)
3950-4000	75 meters (Regional band, used for broadcasting in Asia and Europe)
4750-4995	60 meters (Note 1)
5005-5060	60 meters (Note 1)
5730-5900	49 meter NIB (Note 2)
5900-5950	49 meter WARC-92 band (Note 3)
5950-6200	49 meters
6200-6295	49 meter NIB (Note 2)
6890-6990	41 meter NIB (Note 2)
7100-7300	41 meters (Regional band, not allocated for broadcasting in the western hemisphere) (Note 4)
7300-7350	41 meter WARC-92 band (Note 3)
7350-7600	41 meter NIB (Note 2)
9250-9400	31 meter NIB (Note 2)
9400-9500	31 meter WARC-92 band (Note 3)
9500-9900	31 meters
11500-11600	25 meter NIB (Note 2)
11600-11650	25 meter WARC-92 band (Note 3)
11650-12050	25 meters
12050-12100	25 meter WARC-92 band (Note 3)
12100-12600	25 meter NIB (Note 2)
13570-13600	22 meter WARC-92 band (Note 3)
13600-13800	22 meters
13800-13870	22 meter WARC-92 band (Note 3)
15030-15100	19 meter NIB (Note 2)
15100-15600	19 meters
15600-15800	19 meter WARC-92 band (Note 3)
17480-17550	17 meter WARC-92 band (Note 3)
17550-17900	17 meters
18900-19020	15 meter WARC-92 band (Note 3)
21450-21850	13 meters
25670-26100	11 meters

Notes

Note 1 Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world.

Note 2 Broadcasters can use this frequency range on a (NIB) non-interference basis only.

Note 3 WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007

Note 4 WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide

0000 UTC - 8PM EDT / 7PM CDT / 5PM PDT

0000	0004		Canada, Radio Canada International			6100na
0000	0015	mtwhf	Moldova, (Transnistria) Radio PMR			9665na
0000	0027		Czech Republic, Radio Prague			9790na
0000	0030		Egypt, Radio Cairo	11590na		
0000	0030	vl	Guyana, Voice of Guyana	3290va		
0000	0030		Thailand, Radio Thailand World Service			15275na
0000	0030		USA, Voice of America	7555as		
0000	0045		India, All India Radio	6055as		7305as
			9705as	11645as	13605as	
0000	0056		Romania, Radio Romania International			7385na
			9580na			
0000	0057		Canada, Radio Canada International			11700as
0000	0100		Anguilla, Worldwide Univ Network			6090am
0000	0100		Australia, ABC NT Alice Springs			4835do
0000	0100		Australia, ABC NT Katherine	5025do		
0000	0100		Australia, ABC NT Tennant Creek			4910do
0000	0100		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	17750as
			17715pa	17795pa		
0000	0100		Bahrain, Radio Bahrain	6010me		
0000	0100		Canada, CFRX Toronto ON	6070na		
0000	0100		Canada, CFVP Calgary AB	6030na		
0000	0100		Canada, CKZN St Johns NF	6160na		
0000	0100		Canada, CKZU Vancouver BC	6160na		
0000	0100		China, China Radio International			6020eu
			6075as	6180as	7350eu	7415as
			9570eu	11790as	11885as	13750as
0000	0100		Germany, Deutsche Welle	9885as		15595as
			17525as			
0000	0100		Malaysia, RTM/Traxx FM	7295do		
0000	0100		New Zealand, Radio NZ International			15730pa
0000	0100	DRM	New Zealand, Radio NZ International			15720pa
0000	0100		Russia, Voice of Russia	7440na		9890na
0000	0100		Spain, Radio Exterior de Espana			6055na
0000	0100		Sri Lanka, SLBC	6005as	9770as	15745as
0000	0100		UK, BBC World Service	5970as		6195as
			7395as	9740as	12095as	13725as
0000	0100		Ukraine, Radio Ukraine International			7440na
0000	0100		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0000	0100		USA, EWTN/WEWN Vandiver AL			11520af
0000	0100		USA, WBCQ Monticello ME	5110usb		9330am
			7415usb			
0000	0100		USA, WHRI Cypress Creek SC			5875na
			5920am	7315na		
0000	0100	vl	USA, WINB Red Lion PA	9265ca		
0000	0100		USA, WRMI Miami FL	9955ca		
0000	0100		USA, WTJC Newport NC	9370na		
0000	0100		USA, WTWW Lebanon TN	9480na		
0000	0100		USA, WWCR Nashville TN	4840na		7465na
			9980na			
0000	0100		USA, WWRB Manchester TN	3185na		3215na
			5050na			
0000	0100		USA, WYFR/Family Radio Worldwide			5950na
			6985na	7360sa	7520sa	9505na
			15440na			
0005	0100	twhfa	Canada, Radio Canada International			6100na
0030	0045	twhfas	Albania, Radio Tirana	9860na		
0030	0100		China, China Radio International			11730as
0030	0100		Palau, T8WH/WHRI/Sound of Hope Radio			
			15710as			
0030	0100	mtwhfa	Serbia, International Radio of Serbia			9675na
0030	0100		Thailand, Radio Thailand World Service			15275na
0030	0100	Sun	UK, Bible Voice Broadcasting	7405as		
0030	0100		USA, Voice of America/Special English			7430as
			9715as	9780va	11725va	15205va
			15290va	15560va	17820va	
0040	0100	mtwhf	Moldova, (Transnistria) Radio PMR			9665eu

0100 UTC - 9PM EDT / 8PM CDT / 6PM PDT

0100	0105	twhfa	Canada, Radio Canada International			6100na
0100	0127		Czech Republic, Radio Prague			7345na
0100	0130		China, China Radio International			11730as
0100	0130		Slovakia, Radio Slovakia International			5930na
			9440sa			
0100	0130		Vietnam, Voice of Vietnam	6175na		
0100	0157		North Korea, Voice of Korea	9345as		9730as
			11735sa	13760as	15180as	
0100	0159		Canada, Radio Canada International			9620as
0100	0200		Anguilla, Worldwide Univ Network			6090am
0100	0200		Australia, ABC NT Alice Springs			4835do
0100	0200		Australia, ABC NT Katherine	5025do		
0100	0200		Australia, ABC NT Tennant Creek			4910do
0100	0200		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	17750as
			17715pa	17795pa		
0100	0200		Bahrain, Radio Bahrain	6010me		
0100	0200		Canada, CFRX Toronto ON	6070na		
0100	0200		Canada, CFVP Calgary AB	6030na		
0100	0200		Canada, CKZN St Johns NF	6160na		
0100	0200		Canada, CKZU Vancouver BC	6160na		
0100	0200		China, China Radio International			6020eu
			6175eu	9410eu	9470eu	9535eu
			9570eu	9580na	9790na	11870as
			15785as			
0100	0200	DRM	China, China Radio International			6080na
0100	0200		Cuba, Radio Havana Cuba	5970na		6000na
			6060na			
0100	0200	vl	Guyana, Voice of Guyana	3290va		
0100	0200		Malaysia, RTM/Traxx FM	7295do		
0100	0200		New Zealand, Radio NZ International			13730pa
0100	0200	DRM	New Zealand, Radio NZ International			15720pa
0100	0200		Russia, Voice of Russia	7440na		9890na
0100	0200		Sri Lanka, SLBC	6005as	9770as	15745as
0100	0200		Taiwan, Radio Taiwan International			11875as
0100	0200		UK, BBC World Service	5970as		6195as
			7395as	9410as	9740as	11750as
			12095as	13725as	15310as	15335as
			15360as	17615as		
0100	0200		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0100	0200		USA, EWTN/WEWN Vandiver AL			11520af
0100	0200		USA, KJES Vado NM	7555na		
0100	0200		USA, KJES Vado NM	7555na		
0100	0200		USA, Voice of America	7430va		9780va
			11705va			
0100	0200		USA, WBCQ Monticello ME	5110usb		9330am
			7415usb			
0100	0200		USA, WHRI Cypress Creek SC			5875na
			5920am	7315na		
0100	0200	vl	USA, WINB Red Lion PA	9265ca		
0100	0200		USA, WRMI Miami FL	9955ca		
0100	0200		USA, WRNO New Orleans LA	7505am		
0100	0200		USA, WTJC Newport NC	9370na		
0100	0200		USA, WTWW Lebanon TN	5080na		
0100	0200		USA, WWCR Nashville TN	3215na		4840na
			9980na			
0100	0200		USA, WWRB Manchester TN	3185na		5050na
			5745na			
0100	0200		USA, WYFR/Family Radio Worldwide			6985na
			9505na	15440na		
0130	0200		Iran, VOIRI/IRIB	7245na	9495na	
0130	0200		Palau, T8WH/WHRI/Sound of Hope Radio			
			15710as			
0130	0200		Sweden, Radio Sweden	6010na		
0130	0200	twhfa	USA, Voice of America/Special English			7465ca
			9820ca			
0130	0200		USA, WHRI Cypress Creek SC			5920am
			15710am			
0140	0200		Vatican City State, Vatican Radio			7335va
			11850as			
0145	0200	twhfas	Albania, Radio Tirana	7425na		

0200 UTC - 10PM EDT / 9PM CDT / 7PM PDT

0200	0215		Croatia, Croatian Radio	3985eu		9925am
0200	0227		Iran, VOIRI/IRIB	7245na	9495na	
0200	0230		Thailand, Radio Thailand World Service			15275na
0200	0230		USA, KJES Vado NM	7555na		
0200	0230		USA, KJES Vado NM	7555na		
0200	0230	Sun	USA, WHRI Cypress Creek SC			5875na
0200	0245		USA, WYFR/Family Radio Worldwide			11835na
0200	0257		North Korea, Voice of Korea	13650as		15100as
0200	0300		Anguilla, Worldwide Univ Network			6090am
0200	0300	twhfa	Argentina, Radio Nacional RAE			11710am
0200	0300		Australia, ABC NT Alice Springs			4835do
0200	0300		Australia, ABC NT Katherine	5025do		
0200	0300		Australia, ABC NT Tennant Creek			4910do
0200	0300		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	15515pa
			17750as	21725pa		
0200	0300		Bahrain, Radio Bahrain	6010me		
0200	0300		Bulgaria, Radio Bulgaria	9700na		11700na
0200	0300		Canada, CFRX Toronto ON	6070na		
0200	0300		Canada, CFVP Calgary AB	6030na		
0200	0300		Canada, CKZN St Johns NF	6160na		
0200	0300		Canada, CKZU Vancouver BC	6160na		
0200	0300		China, China Radio International			11770as
			13640as			

0200	0300		Cuba, Radio Havana Cuba	5970na	6000na	6060na
0200	0300		Egypt, Radio Cairo	6270na		
0200	0300	vl	Guyana, Voice of Guyana	3290va		
0200	0300		Malaysia, RTM/Traxx FM	7295do		
0200	0300		New Zealand, Radio NZ International	13730pa		
0200	0300	DRM	New Zealand, Radio NZ International	15720pa		
0200	0300		Palau, T8WH/WHRI/Sound of Hope Radio	15710as		
0200	0300		Philippines, PBS/ Radyo Pilipinas	11880me	15510me	15285me
0200	0300		Russia, Voice of Russia	9665sa	15425na	
0200	0300		South Korea, KBS World Radio	9580sa		
0200	0300		Taiwan, Radio Taiwan International	5950na	9680ca	
0200	0300		UK, BBC World Service	6005af	6195as	9410as 12095as 15310as
0200	0300		USA, American Forces Network	4319usb	5446usb 5765usb 7812usb 12133usb	12759usb 13362usb
0200	0300		USA, EWTN/WEWN Vandiver AL	11520af		
0200	0300		USA, WBCQ Monticello ME	5110usb	9330am	7415usb
0200	0300		USA, WHRI Cypress Creek SC	7315am		15710am
0200	0300	vl	USA, WINB Red Lion PA	9265ca		
0200	0300		USA, WRMI Miami FL	9955ca		
0200	0300		USA, WRNO New Orleans LA	7505am		
0200	0300		USA, WTJC Newport NC	9370na		
0200	0300		USA, WTWW Lebanon TN	9480na		
0200	0300		USA, WWCR Nashville TN	3215na	4840na	5890na
0200	0300		USA, WWRB Manchester TN	3185na	5050na	5745na
0200	0300		USA, WYFR/Family Radio Worldwide	5985ca	6100sa 6985na 9385ca 9505na	
0215	0230		Nepal, Radio Nepal	5005as		
0215	0300		Uganda, UBC Radio	4976do		
0230	0300	twhfas	Albania, Radio Tirana	7425na		
0230	0300		Sweden, Radio Sweden	6010na	9510va	
0230	0300		Vietnam, Voice of Vietnam	6175na		
0245	0300		Australia, HCJB Global Voice Australia	15400as		
0245	0300		India, All India Radio	3945do		
0250	0300		Vatican City State, Vatican Radio	6040am	7305am 9610am	

0300 UTC - 11PM EDT / 10PM CDT / 8PM PDT

0300	0315	Sun	Swaziland, TWR Swaziland	3200af		
0300	0320		Vatican City State, Vatican Radio	6040am	7305am 9610am	
0300	0327		Czech Republic, Radio Prague	7345na		
0300	0330		Egypt, Radio Cairo	6270na		
0300	0330		Philippines, PBS/ Radyo Pilipinas	11880me	15510me 15285me	
0300	0330		Sri Lanka, SLBC 6005as 9770as	15745as		
0300	0330		Vatican City State, Vatican Radio	7360af	9660af 15460as	
0300	0355		South Africa, Channel Africa	6135af		
0300	0356		Romania, Radio Romania International	7335na	9645na 11895as 15340as	
0300	0357		North Korea, Voice of Korea	7200as	9345as	9730as
0300	0400		Anguilla, Worldwide Univ Network	6090am		
0300	0400		Australia, ABC NT Alice Springs	4835do		
0300	0400		Australia, ABC NT Katherine	5025do		
0300	0400		Australia, ABC NT Tennant Creek	4910do		
0300	0400		Australia, Radio Australia	9660pa	12080pa	13690pa 15230pa 15415as 15515pa 17750as 21725pa
0300	0400		Bahrain, Radio Bahrain	6010me		
0300	0400	twhfas	Canada, CBC NQ SW Service	9625na		
0300	0400		Canada, CFRX Toronto ON	6070na		
0300	0400		Canada, CFVP Calgary AB	6030na		
0300	0400		Canada, CKZN St Johns NF	6160na		
0300	0400		Canada, CKZU Vancouver BC	6160na		
0300	0400		China, China Radio International	9690na	9790na 11770as 15110as 15120eu	15785as
0300	0400		Cuba, Radio Havana Cuba	5970na	6000na	6060na
0300	0400		Germany, Deutsche Welle	12005as	15595as	
0300	0400	vl	Guyana, Voice of Guyana	3290va		
0300	0400		Malaysia, RTM/Traxx FM	7295do		
0300	0400		New Zealand, Radio NZ International	13730pa		
0300	0400	DRM	New Zealand, Radio NZ International	15720pa		
0300	0400		Oman, Radio Sultanate of Oman	15355af		
0300	0400		Palau, T8WH/WHRI/Sound of Hope Radio	15700as		
0300	0400		Russia, Voice of Russia	9665sa	15425na	15585as
0300	0400	DRM	Russia, Voice of Russia	15735as		
0300	0400		South Africa, Channel Africa	3345af		
0300	0400		Taiwan, Radio Taiwan International	5950na	15320as	
0300	0400		Turkey, Voice of Turkey	5975va	6165va	
0300	0400		Uganda, UBC Radio	4976do		
0300	0400		UK, BBC World Service	3255af	6005af	6145af 6190af 6195va 7255af 9750af 11945af 12035as 12095as 15310as 17790as
0300	0400		USA, American Forces Network	4319usb	5446usb 5765usb 7812usb 12133usb	12759usb 13362usb
0300	0400		USA, EWTN/WEWN Vandiver AL	9455af		
0300	0400		USA, Voice of America	4930af	6080af	9855af 15580af
0300	0400		USA, WBCQ Monticello ME	5110usb	9330am	7415usb
0300	0400		USA, WHRI Cypress Creek SC	5875na	7315am 15700na	
0300	0400	vl	USA, WINB Red Lion PA	9265ca		
0300	0400		USA, WRMI Miami FL	9955ca		
0300	0400		USA, WRNO New Orleans LA	7505am		
0300	0400		USA, WTJC Newport NC	9370na		
0300	0400		USA, WTWW Lebanon TN	9480na		
0300	0400		USA, WWCR Nashville TN	3215na	4840na	5890na
0300	0400		USA, WWRB Manchester TN	3185na	5050na	5745na
0300	0400		USA, WYFR/Family Radio Worldwide	6985na	9505na 11740sa 15255sa	
0330	0357		Czech Republic, Radio Prague	9445me		
0330	0400	twhfas	Albania, Radio Tirana	7425na		
0330	0400	Sun	Sri Lanka, SLBC 6005as 9770as	15745as		
0330	0400		UK, BBC World Service	11945af		
0330	0400	m	USA, WHRI Cypress Creek SC	5920am		
0330	0400		Vietnam, Voice of Vietnam	6175na		
0345	0400	vl/Sat/Sun	Uganda, UBC Radio	4976do		

0400 UTC - 12AM EDT / 11PM CDT / 9PM PDT

0400	0430	mtwhf	France, Radio France Internationale	7425af	9805af	
0400	0430	Sun	Sri Lanka, SLBC 6005as 9770as	15745as		
0400	0430		USA, Voice of America	4930af	6080af	9855af 12080af 15580af
0400	0445		USA, WYFR/Family Radio Worldwide	6985na	9505na	
0400	0458		New Zealand, Radio NZ International	13730pa		
0400	0458	DRM	New Zealand, Radio NZ International	15720pa		
0400	0500		Anguilla, Worldwide Univ Network	6090am		
0400	0500		Australia, ABC NT Alice Springs	4835do		
0400	0500		Australia, ABC NT Katherine	5025do		
0400	0500		Australia, ABC NT Tennant Creek	4910do		
0400	0500		Australia, Radio Australia	9660pa	12080pa	13690pa 15230pa 15415as 15515pa 17750as 21725pa
0400	0500		Bahrain, Radio Bahrain	6010me		
0400	0500	twhfas	Canada, CBC NQ SW Service	9625na		
0400	0500		Canada, CFRX Toronto ON	6070na		
0400	0500		Canada, CKZN St Johns NF	6160na		
0400	0500		Canada, CKZU Vancouver BC	6160na		
0400	0500		China, China Radio International	6020na	6080na 13750as 15120eu	15785as 17730af 17855af
0400	0500		Cuba, Radio Havana Cuba	5970na	6000na	6060na
0400	0500		Germany, Deutsche Welle	6180af	7240af	12045af 15400af
0400	0500	vl	Guyana, Voice of Guyana	3290va		
0400	0500		Malaysia, RTM/Traxx FM	7295do		
0400	0500		Russia, Voice of Russia	13775na		
0400	0500		South Africa, Channel Africa	3345af		
0400	0500		Sri Lanka, SLBC 6005as 9770as	15745as		
0400	0500		Uganda, UBC Radio	4976do		
0400	0500	DRM	UK, BBC World Service	3995eu		
0400	0500		UK, BBC World Service	3255af	6055af	6190af 7255af 7310af 9410eu 12035af 12095as 13675eu 15310as 15360as 17790as
0400	0500		USA, American Forces Network	4319usb	5446usb 5765usb 7812usb 12133usb	12759usb 13362usb
0400	0500		USA, EWTN/WEWN Vandiver AL	9455af		

0400	0500		USA, WBCQ Monticello ME	5110usb	7415usb	
0400	0500		USA, WHRI Cypress Creek SC		7315am	
0400	0500	smtwhf	USA, WHRI Cypress Creek SC		7365eu	
0400	0500	Sat	USA, WHRI Cypress Creek SC		9825me	
0400	0500		USA, WRMI Miami FL	9955ca		
0400	0500		USA, WRNO New Orleans LA	7505am		
0400	0500		USA, WTJC Newport NC	9370na		
0400	0500		USA, WTWW Lebanon TN	9480na		
0400	0500		USA, WWCR Nashville TN	3215na	4840na	
			5890na			
0400	0500		USA, WWRB Manchester TN	3185na		
0400	0500		USA, WYFR/Family Radio Worldwide		9680na	
0400	0500		Zambia, 1 Africa-CVC Africa	5925af		
0430	0500	Sat/Sun	Greece, Voice of Greece	11645eu		
0430	0500		Palau, T8WH/WHRI/Sound of Hope Radio			
			15700as			
0430	0500	mtwhf	Swaziland, TWR Swaziland	3200af	4775af	
0430	0500		USA, Voice of America	4930af	4960af	
			6080af	12080af	15580af	
0430	0500		USA, WHRI Cypress Creek SC		15700am	
0430	0500	mtwhf	USA, WHRI Cypress Creek SC		5920am	
0455	0500		Nigeria, Voice of Nigeria/External Service		15120eu	
0459	0500		New Zealand, Radio NZ International		11725pa	
0459	0500	DRM	New Zealand, Radio NZ International		11675pa	

0500 UTC - 1AM EDT / 12AM CDT / 10PM PDT

0500	0507	twhfas	Canada, CBC NQ SW Service	9625na		
0500	0530		China, CNR-11/Holy Tibet	9530do	11685do	
			15570do			
0500	0530		Czech Republic, Radio Prague		9955ca	
0500	0530	mtwhf	France, Radio France Internationale		13680af	
0500	0530		Germany, Deutsche Welle	6180af	7430af	
			9700af	9825af		
0500	0530		Japan, NHK World/ Radio Japan		5975va	
			6110na	11970as	15205as	17810as
0500	0530	Sun	UK, BBC World Service	15420af		
0500	0530		Vatican City State, Vatican Radio		4005eu	
			5965eu	7250eu	9660af	11625af
			13765af			
0500	0555		Sri Lanka, SLBC	6005as	9770as	15745as
0500	0600		Anguilla, Worldwide Univ Network		6090am	
0500	0600		Australia, ABC NT Alice Springs		4835do	
0500	0600		Australia, ABC NT Katherine	5025do		
0500	0600		Australia, ABC NT Tennant Creek		4910do	
0500	0600		Australia, Radio Australia	9660pa	12080pa	
			13630as	15160pa	15230pa	15415as
			17750as			
0500	0600		Bahrain, Radio Bahrain	6010me		
0500	0600		Bhutan, Bhutan Broadcasting Service		6035as	
0500	0600		Canada, CFRX Toronto ON	6070na		
0500	0600		Canada, CKZN St Johns NF	6160na		
0500	0600		Canada, CKZU Vancouver BC	6160na		
0500	0600		China, China Radio International		6020na	
			6190na	11710me	11895as	15350as
			15465as	17505af	17540as	17730af
			17855af			
0500	0600		Cuba, Radio Havana Cuba	5970na	6010na	
			6010na	6060na		
0500	0600	DRM	Germany, Deutsche Welle	17525as		
0500	0600	mtwhf	Greece, Voice of Greece	11645eu		
0500	0600	vl	Guyana, Voice of Guyana	3290va		
0500	0600		Kuwait, Radio Kuwait	15110as		
0500	0600		Liberia, Star Radio	4025af		
0500	0600		Malaysia, RTM/Traxx FM	7295do		
0500	0600		New Zealand, Radio NZ International		11725pa	
0500	0600	DRM	New Zealand, Radio NZ International		11675pa	
0500	0600		Nigeria, Voice of Nigeria/External Service		15120eu	
0500	0600		Russia, Voice of Russia	13775na		
0500	0600	mtwh	Slovakia, IRRS/Euro Gospel Radio		5990va	
0500	0600		South Africa, Channel Africa	7230af		
0500	0600		Swaziland, TWR Swaziland	3200af	6120af	
			9500af			
0500	0600		Taiwan, Radio Taiwan International		5950na	
0500	0600		Uganda, UBC Radio	4976do		
0500	0600		UK, BBC World Service	3995eu	7255af	
			7310af	9410eu	11945af	12095va
			15310as	15360as	15560eu	17640af
			17790as			
0500	0600	mtwhf	UK, BBC World Service	15420af		
0500	0600		Ukraine, Radio Ukraine International		9840na	
0500	0600		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0500	0600		USA, EWTN/WEWN Vandiver AL		6890va	
0500	0600		USA, Voice of America	4930af	6080af	
			12080af	15580af		
0500	0600		USA, WBCQ Monticello ME	5110usb	7415usb	
0500	0600		USA, WHRI Cypress Creek SC		5920am	
			7365va	11565pa		
0500	0600		USA, WRMI Miami FL	9955ca		
0500	0600		USA, WTJC Newport NC	9370na		
0500	0600		USA, WTWW Lebanon TN	9480na		
0500	0600		USA, WWCR Nashville TN	3215na	4840na	
0500	0600		USA, WWRB Manchester TN	3185na		
0500	0600		USA, WYFR/Family Radio Worldwide		9680na	
0500	0600		Zambia, 1 Africa-CVC Africa	9430af		
0515	0530		Rwanda, Radio Rwanda	6055do		
0530	0556		Romania, Radio Romania International		9655eu	
			21500pa	17760pa		
0530	0600		Clandestine, Sudan Radio Service/ SRS		13720af	
0530	0600		Palau, T8WH/WHRI/Sound of Hope Radio			
			15700as			
0530	0600	DRM	Romania, Radio Romania International		7305eu	
0530	0600		Thailand, Radio Thailand World Service		17655eu	
0530	0600		USA, WHRI Cypress Creek SC		15700am	

0600 UTC - 2AM EDT / 1AM CDT / 11PM PDT

0600	0630	Sat/Sun	Australia, Radio Australia	15290as		
0600	0630		China, Xizang PBS/Holy Tibet	4905do	4920do	
			5240do	6110do	6130do	6200do
			9490do	9580do		
0600	0630	mtwhf	France, Radio France Internationale		9765af	
			11615af	15160af	17800af	
0600	0630		Germany, Deutsche Welle	7325af	15275af	
0600	0630	Sat/Sun	Greece, Voice of Greece/Radio Filia		11645eu	
0600	0630		Laos, Lao National Radio	7145as		
0600	0645	mtwhf	South Africa, TWR Africa	11640af		
0600	0658		New Zealand, Radio NZ International		11725pa	
0600	0658	DRM	New Zealand, Radio NZ International		11675pa	
0600	0700		Anguilla, Worldwide Univ Network		6090am	
0600	0700		Australia, ABC NT Alice Springs		4835do	
0600	0700		Australia, ABC NT Katherine	5025do		
0600	0700		Australia, ABC NT Tennant Creek		4910do	
0600	0700		Australia, Radio Australia	9660pa	12080pa	
			13630as	13690pa	15160pa	15230pa
			17750as			
0600	0700		Bahrain, Radio Bahrain	6010me		
0600	0700		Canada, CFRX Toronto ON	6070na		
0600	0700		Canada, CFVP Calgary AB	6030na		
0600	0700		Canada, CKZN St Johns NF	6160na		
0600	0700		Canada, CKZU Vancouver BC	6160na		
0600	0700		China, China Radio International		11710me	
			11870af	11895as	13660as	15140af
			15350as	15465as	17505af	17540as
0600	0700		Cuba, Radio Havana Cuba	5970na	6000na	
			6010na	6060na		
0600	0700	DRM	Germany, Deutsche Welle	3995eu	6130eu	
0600	0700	vl	Guyana, Voice of Guyana	3290va		
0600	0700		Kuwait, Radio Kuwait	15110as		
0600	0700		Liberia, Star Radio	4025af		
0600	0700		Malaysia, RTM/Traxx FM	7295do		
0600	0700		Malaysia, RTM/Voice of Malaysia		6175as	
			9750as	15295as		
0600	0700		Nigeria, Voice of Nigeria/External Service		15120eu	
0600	0700		Palau, T8WH/WHRI/Sound of Hope Radio			
			15700as			
0600	0700		Papua New Guinea, Radio Wantok Light		7325do	
0600	0700		Russia, Voice of Russia	15405pa		
0600	0700		South Africa, Channel Africa	7230af		
0600	0700		Swaziland, TWR Swaziland	4775af	6120af	
			9500af			
0600	0700		Uganda, UBC Radio	7195do		
0600	0700		UK, BBC World Service	3995eu	6005af	
			6190af	7310af	9860af	12015af
			12095as	15105af	15310as	17640af
			17790as			
0600	0700	Sat/Sun	UK, BBC World Service	15420af		
0600	0700	DRM	UK, BBC World Service	3995eu		
0600	0700		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0600	0700		USA, EWTN/WEWN Vandiver AL		6890va	
0600	0700		USA, Voice of America	6080af	12080af	
			15580af			
0600	0700		USA, WBCQ Monticello ME	5110usb	7415usb	
0600	0700		USA, WHRI Cypress Creek SC		5920am	
			7365va	11565pa	15700am	
0600	0700		USA, WRMI Miami FL	9955ca		
0600	0700		USA, WTJC Newport NC	9370na		
0600	0700		USA, WTWW Lebanon TN	9480na		
0600	0700		USA, WWCR Nashville TN	3215na	4840na	
0600	0700		USA, WWRB Manchester TN	3185na		
0600	0700		USA, WYFR/Family Radio Worldwide		5850ca	
			7520va	9680na	11530af	11580va

0600	0700		Zambia, 1 Africa-CVC Africa	13590af			
0600	0700	vl	Zambia, Radio Christian Voice/The Voice Africa	6065af			
0600	615	Sat/Sun	South Africa, TWR Africa	11640af			
0630	0645		Vatican City State, Vatican Radio	4005eu	5965eu	7250eu	9645af
			11740eu	15595eu			
0630	0700		Bulgaria, Radio Bulgaria	9600eu	11600eu		
0630	0700		Vatican City State, Vatican Radio	11625af	13765af	15570af	
0645	0700	Sun	Germany, TWR Europe	6105eu			
0645	0700	Sun	Monaco, TWR Europe	9800eu			
0659	0700		New Zealand, Radio NZ International	6170pa			
0659	0700	DRM	New Zealand, Radio NZ International	7440pa			

0700 UTC - 3AM EDT / 2AM CDT / 12AM PDT

0700	0727		Czech Republic, Radio Prague	9880eu			
0700	0730	mtwhf	France, Radio France Internationale	13675af			
0700	0730		Slovakia, Radio Slovakia International	9440va	11650va		
0700	0730	Sun	UK, Bible Voice Broadcasting	5945eu			
0700	0745	Sat	UK, Bible Voice Broadcasting	5945eu			
0700	0745		USA, WYFR/Family Radio Worldwide	7520va			
0700	0750	Sun	Germany, TWR Europe	6105eu			
0700	0750	mtwhf	Germany, TWR Europe	6105eu			
0700	0750	mtwhf	Monaco, TWR Europe	9800eu			
0700	0800		Anguilla, Worldwide Univ Network	6090am			
0700	0800		Australia, ABC NT Alice Springs	4835do			
0700	0800		Australia, ABC NT Katherine	5025do			
0700	0800		Australia, ABC NT Tennant Creek	4910do			
0700	0800		Australia, Radio Australia	9475as	9660pa	9710as	11945pa
			12080pa				
0700	0800		Bahrain, Radio Bahrain	6010me			
0700	0800	m/DRM	Belgium, TDP Radio	6015eu			
0700	0800		Canada, CFRX Toronto ON	6070na			
0700	0800		Canada, CFVP Calgary AB	6030na			
0700	0800		Canada, CKZN St Johns NF	6160na			
0700	0800		Canada, CKZU Vancouver BC	6160na			
0700	0800		China, China Radio International	11895as	13660as	13710eu	15125me
			15350as	17710as			
0700	0800	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af			
0700	0800	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af			
0700	0800	DRM	Germany, Deutsche Welle	5790eu	9545eu		
0700	0800	vl	Guyana, Voice of Guyana	3290va			
0700	0800		Kuwait, Radio Kuwait	15110as			
0700	0800		Liberia, Star Radio	4025af			
0700	0800		Malaysia, RTM/Traxx FM	7295do			
0700	0800		Malaysia, RTM/Voice of Malaysia	6175as	9750as	15295as	
0700	0800		Myanmar, Myanma Radio	9730do			
0700	0800		New Zealand, Radio NZ International	6170pa			
0700	0800	DRM	New Zealand, Radio NZ International	7440pa			
0700	0800		Palau, T8WH/WHRI/Sound of Hope Radio	9930as	15725as		
0700	0800		Papua New Guinea, Radio Wantok Light	7325do			
0700	0800		Russia, Voice of Russia	15405pa	17495va		
0700	0800		South Africa, Channel Africa	7230af			
0700	0800		Swaziland, TWR Swaziland	4775af	6120af	9500af	
0700	0800		Uganda, UBC Radio	7195do			
0700	0800		UK, BBC World Service	5790eu	6190af	9860af	11760me
			11765af	13830af	15400af	15575as	17790as
			17830af				
0700	0800	Sat/Sun	UK, BBC World Service	15420af			
0700	0800		USA, American Forces Network	4319usb	5446usb	5765usb	7812usb
			12133usb	12759usb	13362usb		
0700	0800		USA, EWTN/WEWN Vandiver AL	6890va			
0700	0800		USA, WBCQ Monticello ME	5110usb	7415usb		
0700	0800		USA, WHRI Cypress Creek SC	5920am	7365va	9930va	11565pa
0700	0800		USA, WRMI Miami FL	9955ca			
0700	0800		USA, WTJC Newport NC	9370na			
0700	0800		USA, WTWW Lebanon TN	9480na			
0700	0800		USA, WWCR Nashville TN	3215na	4840na		
0700	0800		USA, WWRB Manchester TN	3185na			
0700	0800		USA, WYFR/Family Radio Worldwide	5950na	5985na	6875na	9385af
			9505ca				
0700	0800		Zambia, 1 Africa-CVC Africa	13590af			
0700	0800	vl	Zambia, Radio Christian Voice/The Voice Africa	6065af			
0715	0750	Sat	Germany, TWR Europe	6105eu			
0715	0750	Sat	Monaco, TWR Europe	9800eu			
0730	0800		Australia, HCJB Global Voice Australia	11750as			
0730	0800		Clandestine, Cotton Tree News	15220af			

0800 UTC - 4AM EDT / 3AM CDT / 1AM PDT

0800	0830		Australia, ABC NT Alice Springs	4835do			
0800	0830		Australia, ABC NT Katherine	5025do			
0800	0830		Australia, ABC NT Tennant Creek	4910do			
0800	0830		Myanmar, Myanma Radio	9730do			
0800	0845		USA, WYFR/Family Radio Worldwide	5950na	5985na	9385af	
0800	0900		Anguilla, Worldwide Univ Network	6090am			
0800	0900		Australia, HCJB Global Voice Australia	11750pa			
0800	0900		Australia, Radio Australia	5995pa	9475as	9580pa	9590pa
			9710pa	11945pa	12080pa	13630as	
0800	0900		Bahrain, Radio Bahrain	6010me			
0800	0900	t/DRM	Belgium, TDP Radio	6015eu			
0800	0900		Bhutan, Bhutan Broadcasting Service	6035as			
0800	0900		Canada, CFRX Toronto ON	6070na			
0800	0900		Canada, CFVP Calgary AB	6030na			
0800	0900		Canada, CKZN St Johns NF	6160na			
0800	0900		Canada, CKZU Vancouver BC	6160na			
0800	0900		China, China Radio International	11620as	11895as	13710eu	15350as
			15465as	15625me	17540as		
0800	0900	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af			
0800	0900	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af			
0800	0900	DRM	Germany, Deutsche Welle	12095as			
0800	0900	vl	Guyana, Voice of Guyana	3290va			
0800	0900		Liberia, Star Radio	4025af			
0800	0900		Malaysia, RTM/Traxx FM	7295do			
0800	0900		Malaysia, RTM/Voice of Malaysia	6175as	9750as	15295as	
0800	0900		New Zealand, Radio NZ International	6170pa			
0800	0900	DRM	New Zealand, Radio NZ International	7440pa			
0800	0900		Palau, T8WH/WHRI/Sound of Hope Radio	15725as			
0800	0900	mtwhfs	Palau, T8WH/WHRI/Sound of Hope Radio	9930as			
0800	0900		Papua New Guinea, Radio Wantok Light	7325do			
0800	0900	DRM	Russia, Voice of Russia	12060eu			
0800	0900	Sun	South Africa, Amateur Radio Mirror Intl	7205af	17570af		
0800	0900		South Africa, Channel Africa	9625af			
0800	0900		South Korea, KBS World Radio	9570as			
0800	0900		Swaziland, TWR Swaziland	4775af	6120af	9500af	
0800	0900		Uganda, UBC Radio	7195do			
0800	0900		UK, BBC World Service	6190af	9860af	11760me	15310as
			15400af	15575as	17640af	17790as	17830af
			21470af				
0800	0900		USA, American Forces Network	4319usb	5446usb	5765usb	7812usb
			12133usb	12759usb	13362usb		
0800	0900		USA, EWTN/WEWN Vandiver AL	6890va			
0800	0900		USA, KNLS Anchor Point AK	11765as			
0800	0900		USA, WBCQ Monticello ME	5110usb	7415usb		
0800	0900		USA, WHRI Cypress Creek SC	5920am	9930pa	11565pa	
0800	0900		USA, WRMI Miami FL	9955ca			
0800	0900		USA, WTJC Newport NC	9370na			
0800	0900		USA, WTWW Lebanon TN	9480na			
0800	0900		USA, WWCR Nashville TN	3215na	4840na		
0800	0900		USA, WWRB Manchester TN	3185na			
0800	0900		USA, WYFR/Family Radio Worldwide	5985na	6875na		
0800	0900		Zambia, 1 Africa-CVC Africa	13590af			
0800	0900	vl	Zambia, Radio Christian Voice/The Voice Africa	6065af			
0815	0825		Nepal, Radio Nepal	5005as			
0820	0900	smtwhf	Guam, KTWR/TWR	15170as			
0830	0900		Australia, ABC NT Alice Springs	2310do			
0830	0900		Australia, ABC NT Katherine	2485do			
0830	0900		Australia, ABC NT Tennant Creek	2325do			
0830	0900	mtwhfa	Guam, KTWR/TWR	11840pa			

0900 UTC - 5AM EDT / 4AM CDT / 2AM PDT

0900	0910	mtwhfa	Guam, KTWR/TWR	11840pa			
0900	0929		Czech Republic, Radio Prague	17650af			
0900	0930		Australia, HCJB Global Voice Australia	11750pa			
0900	0930	DRM	Bulgaria, Radio Bulgaria	11900eu			
0900	0930	mtwhfa	Palau, T8WH/WHRI/Sound of Hope Radio	9930as			
0900	0959		Germany, Deutsche Welle	15640as	17820as		
0900	1000		Anguilla, Worldwide Univ Network	6090am			
0900	1000		Australia, ABC NT Alice Springs	2310do			
0900	1000		Australia, ABC NT Katherine	2485do			
0900	1000		Australia, ABC NT Tennant Creek	2325do			

0900	1000		Australia, Radio Australia	9475as	9580pa	
			9590pa	11945pa		
0900	1000		Bahrain, Radio Bahrain	6010me		
0900	1000	w/DRM	Belgium, TDP Radio	6015eu		
0900	1000		Canada, CFRX Toronto ON	6070na		
0900	1000		Canada, CFVP Calgary AB	6030na		
0900	1000		Canada, CKZN St Johns NF	6160na		
0900	1000		Canada, CKZU Vancouver BC	6160na		
0900	1000		China, China Radio International			11620as
			13790pa	15210as	15270eu	15350as
			17490eu	17570eu	17750as	
0900	1000	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
0900	1000	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0900	1000	2nd Sun	Germany, Blue Star Radio	6140eu		
0900	1000	4th Sun	Germany, Radio Gloria International			6140eu
0900	1000		Malaysia, RTM/Traxx FM	7295do		
0900	1000		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0900	1000		New Zealand, Radio NZ International			6170pa
0900	1000	DRM	New Zealand, Radio NZ International			7440pa
0900	1000		Nigeria, Voice of Nigeria/External Service			9690af
0900	1000		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
0900	1000		Papua New Guinea, Radio Wantok Light			7325do
0900	1000		Russia, Voice of Russia	17495pa		
0900	1000	DRM	Russia, Voice of Russia	12060eu		
0900	1000	3rd Sat	Slovakia, IRRS/Radio City	9510va		
0900	1000	1st Sat	Slovakia, IRRS/Radio Joystick	9510va		
0900	1000		Tajikistan, Voice of Tajik/External Service			7245va
0900	1000		Uganda, UBC Radio	7195do		
0900	1000	DRM	UK, BBC World Service	9610eu		13810eu
0900	1000		UK, BBC World Service	6190af		6195as
			9740as	9860af	11760me	15105as
			15285as	15310as	15400af	15575as
			17640as	17760as	17830af	21470af
			21660as			
0900	1000		Ukraine, Radio Ukraine International			11620na
0900	1000		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0900	1000		USA, EWTN/WEWN Vandiver AL			11520va
0900	1000		USA, WBCQ Monticello ME	5110usb		
0900	1000		USA, WHRI Cypress Creek SC			5920am
			7365na	9930pa	11565pa	
0900	1000		USA, WRMI Miami FL	9955ca		
0900	1000		USA, WTJC Newport NC	9370na		
0900	1000		USA, WTWW Lebanon TN	9480na		
0900	1000		USA, WWCR Nashville TN	4840na		9985na
0900	1000		USA, WWRB Manchester TN	3185na		
0900	1000		USA, WYFR/Family Radio Worldwide			5985na
			6875na	9465as	9755na	
0900	1000		Zambia, 1 Africa-CVC Africa	13590af		
0900	1000	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
0930	1000		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
0930	1000		Saudi Arabia, BSKSA/Saudi Radio			15250af
0930	1000	Sun	Slovakia, IRRS/Euro Gospel Radio			9515va

1000 UTC - 6AM EDT / 5AM CDT / 3AM PDT

1000	1030		Czech Republic, Radio Prague			9955na
1000	1030		Japan, NHK World/ Radio Japan			9605as
			9625pa	9825pa	11780as	
1000	1030	fa	Philippines, FEBC	15325as		
1000	1030		Vietnam, Voice of Vietnam	9840as		12020as
1000	1057		Netherlands, R Netherlands Worldwide			11895as
			12065as	15110as		
1000	1057		North Korea, Voice of Korea	11710sa		11735sa
			13650as	15180sa		
1000	1058		New Zealand, Radio NZ International			6170pa
1000	1100		Anguilla, Worldwide Univ Network			11775am
1000	1100		Australia, ABC NT Alice Springs			2310do
1000	1100		Australia, ABC NT Katherine	2485do		
1000	1100		Australia, ABC NT Tennant Creek			2325do
1000	1100		Australia, Radio Australia	9475as		9580pa
			9590pa	11945pa		
1000	1100		Bahrain, Radio Bahrain	6010me		
1000	1100	h/DRM	Belgium, TDP Radio	6015eu		
1000	1100		Canada, CFRX Toronto ON	6070na		
1000	1100		Canada, CFVP Calgary AB	6030na		
1000	1100		Canada, CKZN St Johns NF	6160na		
1000	1100		Canada, CKZU Vancouver BC	6160na		
1000	1100		China, China Radio International			6040na
			11610as	11635eu	13590as	13620as
			13720as	13790pa	15190as	15350as
			17490eu			
1000	1100	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
1000	1100	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1000	1100	DRM	Germany, Deutsche Welle	9545eu		13810eu
1000	1100	3rd Sun	Germany, European Music Radio			6140eu
1000	1100		India, All India Radio	7270as		13695pa
			15020as	15260as	15410as	17510pa
			17895pa			
1000	1100		Indonesia, Voice of Indonesia	9526va		11785al
1000	1100		Malaysia, RTM/Traxx FM	7295do		
1000	1100	DRM	New Zealand, Radio NZ International			7440pa
1000	1100		Nigeria, Voice of Nigeria/External Service			9690af
1000	1100		Palau, T8WH/WHRI/Sound of Hope Radio			
			15725as			
1000	1100		Papua New Guinea, Radio Wantok Light			7325do
1000	1100		Saudi Arabia, BSKSA/Saudi Radio			15250af
			15470af			
1000	1100	Sun	Slovakia, IRRS/Euro Gospel Radio			9515va
1000	1100		Uganda, UBC Radio	7195do		
1000	1100	DRM	UK, BBC World Service	9545eu		13810eu
1000	1100	Sat/Sun	UK, BBC World Service	15400af		17830af
1000	1100		UK, BBC World Service	6190af		6195as
			9545eu	9740as	9860af	11760me
			15285as	15310as	15575as	17640af
			17790as	21470af	21660as	
1000	1100		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1000	1100		USA, EWTN/WEWN Vandiver AL			11520va
1000	1100		USA, KNLS Anchor Point AK	11765as		
1000	1100		USA, WHRI Cypress Creek SC			5920am
			9930pa	11565pa	15725pa	
1000	1100	vl	USA, WINB Red Lion PA	9265ca		
1000	1100		USA, WRMI Miami FL	9955ca		
1000	1100		USA, WTJC Newport NC	9370na		
1000	1100		USA, WTWW Lebanon TN	9480na		
1000	1100		USA, WWCR Nashville TN	4840na		9985na
1000	1100		USA, WWRB Manchester TN	3185na		
1000	1100		USA, WYFR/Family Radio Worldwide			5950na
			5985na	6875na	9450as	9465as
			9755na			
1000	1100		Zambia, 1 Africa-CVC Africa	13590af		
1000	1100	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
1030	1057		Czech Republic, Radio Prague			9880eu
1030	1100		Iran, VOIRI/IRIB	15600as	17660as	
1030	1100		Mongolia, Voice of Mongolia	12085as		
1059	1100		New Zealand, Radio NZ International			9655pa

1100 UTC - 7AM EDT / 6AM CDT / 4AM PDT

1100	1105		Pakistan, PBC/Radio Pakistan	15100as		17720as
1100	1127		Iran, VOIRI/IRIB	15600as	17660as	
1100	1130	f/DRM	Japan, NHK World/ Radio Japan			9760eu
1100	1130	Sat/DRM	South Korea, KBS World Radio			9760eu
1100	1130	mtwhf	UK, BBC World Service	15400af		
1100	1130		Vietnam, Voice of Vietnam	7285as		
1100	1145		USA, WYFR/Family Radio Worldwide			6875na
			9550sa	9755na		
1100	1156		Romania, Radio Romania International			15210eu
			15430eu	17510af	17670af	
1100	1158	DRM	New Zealand, Radio NZ International			7440pa
1100	1200		Anguilla, Worldwide Univ Network			11775am
1100	1200		Australia, ABC NT Alice Springs			2310do
1100	1200		Australia, ABC NT Katherine	2485do		
1100	1200		Australia, ABC NT Tennant Creek			2325do
1100	1200		Australia, Radio Australia	5995pa		6020pa
			9475as	9580pa	9590pa	9965as
			11945pa			
1100	1200	DRM	Australia, Radio Australia	12080pa		
1100	1200		Bahrain, Radio Bahrain	6010me		
1100	1200	f/DRM	Belgium, TDP Radio	6015eu		
1100	1200	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1100	1200		Canada, CFRX Toronto ON	6070na		
1100	1200		Canada, CFVP Calgary AB	6030na		
1100	1200		Canada, CKZN St Johns NF	6160na		
1100	1200		Canada, CKZU Vancouver BC	6160na		
1100	1200		China, China Radio International			5955as
			6040na	11650as	11660as	11750na
			11795as	13590as	13645as	13650eu
			13720as	17490eu		
1100	1200	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
1100	1200	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1100	1200		Malaysia, RTM/Traxx FM	7295do		
1100	1200		New Zealand, Radio NZ International			9655pa
1100	1200		Nigeria, Voice of Nigeria/External Service			9690af
1100	1200		Papua New Guinea, Radio Wantok Light			7325do
1100	1200		Saudi Arabia, BSKSA/Saudi Radio			15250af
			15470af			
1100	1200	Sun	Slovakia, IRRS/Euro Gospel Radio			9515va

SHORTWAVE GUIDE

1100	1200		Taiwan, Radio Taiwan International			7445as
			11715as			
1100	1200		Uganda, UBC Radio		7195do	
1100	1200		UK, BBC World Service		6190af	6195as
			9545eu	9740as	9860af	11760me
			15280as	15310as	15575as	17640af
			17790as	17830af	21470af	
1100	1200		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1100	1200		USA, EWTN/WEWN Vandiver AL			11520va
1100	1200		USA, WHRI Cypress Creek SC			5920am
			7315am			
1100	1200	vl	USA, WINB Red Lion PA		9265ca	
1100	1200		USA, WRMI Miami FL		9955ca	
1100	1200		USA, WTJC Newport NC		9370na	
1100	1200		USA, WTWW Lebanon TN		5080na	
1100	1200		USA, WWCR Nashville TN		4840na	5890na
			15825na			
1100	1200		USA, WWRB Manchester TN		3185na	
1100	1200		USA, WYFR/Family Radio Worldwide			5950na
			5985na	7730sa	9625sa	15560as
1100	1200		Zambia, 1 Africa-CVC Africa		13590af	
1100	1200	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
1130	1200	Sat/Sun	Australia, HCJB Global Voice Australia			15400as
1130	1200	f	Vatican City State, Vatican Radio/Mass			15595me
			17765me			
1130	1200		Vietnam, Voice of Vietnam		9840as	12020as
1145	1200	Sat/Sun	UK, Bible Voice Broadcasting		7245as	

1200 UTC - 8AM EDT / 7AM CDT / 5AM PDT

1200	1215		Nepal, Radio Nepal		5005as	
1200	1215	Sat/Sun	UK, Bible Voice Broadcasting		7245as	
1200	1215	mtwhfa	Vatican City State, Vatican Radio			9830am
1200	1230	mtwhf	France, Radio France Internationale			17800af
			21620af			
1200	1230		Germany, AWR Europe		15435as	
1200	1230		Japan, NHK World/ Radio Japan			6120na
			9625pa	9695as	9790eu	
1200	1230		Saudi Arabia, BSKSA/Saudi Radio			15250af
1200	1245		USA, WYFR/Family Radio Worldwide			5950na
			5985na			
1200	1258		New Zealand, Radio NZ International			9655pa
1200	1259		Poland, Polskie Radio Warsaw			11675eu
			11980eu			
1200	1300		Anguilla, Worldwide Univ Network			11775am
1200	1300		Australia, ABC NT Alice Springs			2310do
1200	1300		Australia, ABC NT Katherine		2485do	
1200	1300		Australia, ABC NT Tennant Creek			2325do
1200	1300	Sat/Sun	Australia, HCJB Global Voice Australia			15400as
1200	1300		Australia, Radio Australia		6020pa	9475as
			9580pa	9965as	11945pa	
1200	1300	DRM	Australia, Radio Australia		5995pa	
1200	1300		Bahrain, Radio Bahrain		6010me	
1200	1300	a/DRM	Belgium, TDP Radio		6015eu	
1200	1300	Sat/Sun	Canada, CBC NQ SW Service		9625na	
1200	1300		Canada, CFRX Toronto ON		6070na	
1200	1300		Canada, CFVP Calgary AB		6030na	
1200	1300		Canada, CKZN St Johns NF		6160na	
1200	1300		Canada, CKZU Vancouver BC		6160na	
1200	1300		China, China Radio International			5955as
			9460as	9660as	9730as	9760pa
			11650as	11660as	11690me	11760pa
			11980as	13645as	13650eu	13790eu
			17490eu			
1200	1300	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1200	1300	mtwhf	Ethiopia, Radio Ethiopia/National Service			5990do
			7110do	9704do		
1200	1300	DRM	Germany, Deutsche Welle		9545eu	13810eu
1200	1300		Malaysia, RTM/Traxx FM		7295do	
1200	1300		Nigeria, Voice of Nigeria/External Service			9690af
1200	1300	mwfs	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
1200	1300		Papua New Guinea, Radio Wantok Light			7325do
1200	1300		Russia, Voice of Russia		11500as	
1200	1300		Saudi Arabia, BSKSA/Saudi Radio			15470af
1200	1300		South Korea, KBS World Radio			9650na
1200	1300		Uganda, UBC Radio		7195do	
1200	1300		UK, BBC World Service		5875as	6190af
			6195as	9545eu	9740as	9860af
			11750as	11760me	15310as	15575as
			17640af	17790as	17830af	
1200	1300		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1200	1300		USA, EWTN/WEWN Vandiver AL			11520va
1200	1300		USA, KNLS Anchor Point AK		7355as	9680as
1200	1300		USA, Voice of America		7575va	9510va
			9760va	12075va		
1200	1300		USA, WBCQ Monticello ME		9330am	
1200	1300		USA, WHRI Cypress Creek SC			5920am
			7315am	9930pa		
1200	1300	Sat/Sun	USA, WHRI Cypress Creek SC			9410na
1200	1300	vl	USA, WINB Red Lion PA		9265ca	
1200	1300		USA, WRMI Miami FL		9955ca	
1200	1300		USA, WTJC Newport NC		9370na	
1200	1300		USA, WTWW Lebanon TN		9479na	
1200	1300		USA, WWCR Nashville TN		7490af	9980na
			13845na	15825na		
1200	1300		USA, WWRB Manchester TN		3185na	
1200	1300		USA, WYFR/Family Radio Worldwide			17555sa
			17795na			
1200	1300		Zambia, 1 Africa-CVC Africa		13590af	
1200	1300	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
1215	1300		Egypt, Radio Cairo		17870as	
1215	1300	mtwhyf	UK, BBC World Service		9410ca	11860ca
1230	1300	mtwhf	Australia, HCJB Global Voice Australia			15400as
1230	1300		Bangladesh, Bangladesh Betar			7250as
1230	1300	Sat	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
1230	1300		Thailand, Radio Thailand World Service			9890va
1230	1300		Vietnam, Voice of Vietnam		9840as	12020as
1230	13000		Turkey, Voice of Turkey		15450eu	15520as

1300 UTC - 9AM EDT / 8AM CDT / 6AM PDT

1300	1329		Czech Republic, Radio Prague			11600eu
1300	1330		Australia, HCJB Global Voice Australia			15400as
1300	1330		Egypt, Radio Cairo		17870as	
1300	1330		Japan, NHK World/ Radio Japan			11985as
1300	1330		Turkey, Voice of Turkey		15450as	15520eu
1300	1330	Sun	USA, WHRI Cypress Creek SC			11785na
1300	1357		North Korea, Voice of Korea		9335eu	11710na
			13760as	15245eu		
1300	1400		Anguilla, Worldwide Univ Network			11775am
1300	1400		Australia, ABC NT Alice Springs			2310do
1300	1400		Australia, ABC NT Katherine		2485do	
1300	1400		Australia, Radio Australia		6020pa	9580pa
			9590pa			
1300	1400	DRM	Australia, Radio Australia		5995pa	
1300	1400		Bahrain, Radio Bahrain		6010me	
1300	1400	s/DRM	Belgium, TDP Radio		6015na	
1300	1400	Sat/Sun	Canada, CBC NQ SW Service		9625na	
1300	1400		Canada, CFRX Toronto ON		6070na	
1300	1400		Canada, CFVP Calgary AB		6030na	
1300	1400		Canada, CKZN St Johns NF		6160na	
1300	1400		Canada, CKZU Vancouver BC		6160na	
1300	1400		China, China Radio International			5995as
			9570na	9650na	9730as	9765as
			9870as	11660as	11760me	11980as
			13610eu	13755as	15260na	
1300	1400	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1300	1400		Indonesia, Voice of Indonesia		9526va	11785al
1300	1400		Malaysia, RTM/Traxx FM		7295do	
1300	1400		New Zealand, Radio NZ International			6170pa
1300	1400		Nigeria, Voice of Nigeria/External Service			9690af
1300	1400		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
1300	1400		Papua New Guinea, Radio Wantok Light			7325do
1300	1400		South Korea, KBS World Radio			9770as
1300	1400		Tajikistan, Voice of Tajik/External Service			7245va
1300	1400		Uganda, UBC Radio		4976do	
1300	1400		UK, BBC World Service		5875as	6190af
			6195as	9545eu	9740as	9860af
			11760me	15310as	15420af	15575as
			17640af	17790as	17830af	21470af
1300	1400		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1300	1400		USA, EWTN/WEWN Vandiver AL			13835eu
1300	1400		USA, KJES Vado NM		11715na	
1300	1400		USA, KJES Vado NM		11715na	
1300	1400	Sat/Sun	USA, Voice of America		7575va	9510va
			9760va			
1300	1400		USA, WBCQ Monticello ME		9330am	
1300	1400	Sat/Sun	USA, WHRI Cypress Creek SC			9495am
			9840na			
1300	1400		USA, WHRI Cypress Creek SC			9930pa
1300	1400	vl	USA, WINB Red Lion PA		9265ca	
1300	1400		USA, WRMI Miami FL		9955ca	
1300	1400		USA, WTJC Newport NC		9370na	
1300	1400		USA, WTWW Lebanon TN		9479na	
1300	1400		USA, WWCR Nashville TN		7490af	9980na
			13845na	15825na		

1300	1400		USA, WWRB Manchester TN	9385na		
1300	1400		USA, WYFR/Family Radio Worldwide	11520as		
			11560as	11830na	11910na	12155as
			13820as	17795na		
1300	1400		Zambia, 1 Africa-CVC Africa	13590af		
1300	1400	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
1305	1400	Sun	Greece, Voice of Greece	9420va	15630va	
1330	1400	mta	Guam, KSDA/AWR	11860as		
1330	1400		India, All India Radio	9690as	11620as	
			13710as			
1330	1400		Laos, Lao National Radio	7145as		
1330	1400		Sweden, Radio Sweden	15735va		
1330	1400	Sat/Sun	USA, WHRI Cypress Creek SC	11785na		
1330	1400		Vietnam, Voice of Vietnam	9840as	12020as	

1400 UTC - 10AM EDT / 9AM CDT / 7AM PDT

1400	1425	mh	Guam, KTWR/TWR	9975as		
1400	1430		China, CNR-11/Holy Tibet	6010do	7350do	
			9480do			
1400	1430	Sun	Germany, Pan American Broadcasting	15205as		
1400	1430	`	Japan, NHK World/ Radio Japan	11705as		
			11985as	21560va		
1400	1430		Thailand, Radio Thailand World Service	9575va		
1400	1430	Sun	United Arab Emirates, FEBA Radio	12025as		
1400	1435	twfas	Guam, KTWR/TWR	9975as		
1400	1500		Anguilla, Worldwide Univ Network	11775am		
1400	1500		Australia, ABC NT Alice Springs	2310do		
1400	1500		Australia, ABC NT Katherine	2485do		
1400	1500		Australia, ABC NT Tennant Creek	2325do		
1400	1500		Australia, Radio Australia	6080pa	7240pa	
			9590pa			
1400	1500		Bahrain, Radio Bahrain	6010me		
1400	1500	DRM	Belgium, TDP Radio/Disco Palace	6015eu		
1400	1500		Bhutan, Bhutan Broadcasting Service	6035as		
1400	1500	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1400	1500		Canada, CFRX Toronto ON	6070na		
1400	1500		Canada, CFVP Calgary AB	6030na		
1400	1500		Canada, CKZN St Johns NF	6160na		
1400	1500		Canada, CKZU Vancouver BC	6160na		
1400	1500		China, China Radio International	5955as		
			9765as	9870as	11665as	11675as
			11765eu	13710as	13740na	13790eu
			17630as			
1400	1500	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
1400	1500		India, All India Radio	9690as	11620as	
			13710as			
1400	1500		Libya, LJB/Voice of Africa	15235af	15240af	
1400	1500		Malaysia, RTM/Traxx FM	7295do		
1400	1500		Netherlands, R Netherlands Worldwide	11835as		
			15745as			
1400	1500		New Zealand, Radio NZ International	6170pa		
1400	1500		Nigeria, Voice of Nigeria/External Service	9690af		
1400	1500		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
1400	1500		Papua New Guinea, Radio Wantok Light	7325do		
1400	1500		Russia, Voice of Russia	4975va	9455as	
			11500as			
1400	1500	DRM	Russia, Voice of Russia	9750eu		
1400	1500		South Africa, Channel Africa	9625af		
1400	1500		Uganda, UBC Radio	4976do		
1400	1500		UK, BBC World Service	5790eu	5875as	
			6190af	6195as	7230af	9740as
			11920as	12095as	15310as	17640af
			17830af	21470af		
1400	1500	DRM	UK, BBC World Service	9545eu	13590eu	
1400	1500	Sat	UK, Bible Voice Broadcasting	15265as		
1400	1500		United States, Overcomer Ministries	6110eu		
			13810va			
1400	1500		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1400	1500		USA, EWTN/WEWN Vandiver AL	13835as		
1400	1500		USA, KJES Vado NM	11715am		
1400	1500		USA, KNLS Anchor Point AK	11765as		
1400	1500		USA, Voice of America	6080af	12080af	
			15530va	15580af	17740va	17585af
1400	1500	mtwhf	USA, Voice of America	7540va	7575va	
			9760va			
1400	1500		USA, WBCQ Monticello ME	9330am		
1400	1500	Sat/Sun	USA, WHRI Cypress Creek SC	9840na		
			11785na	17510am		
1400	1500		USA, WHRI Cypress Creek SC	9930pa		
1400	1500	vl	USA, WINB Red Lion PA	9265ca		
1400	1500		USA, WJHR International Milton FL	15550usb		
1400	1500		USA, WRMI Miami FL	9955ca		
1400	1500		USA, WTJC Newport NC	9370na		
1400	1500		USA, WTWW Lebanon TN	9479na		
1400	1500		USA, WWCR Nashville TN	7490af	9980na	
			13845na	15825na		
1400	1500		USA, WWRB Manchester TN	9385na		
1400	1500		USA, WYFR/Family Radio Worldwide	9365as		
			9615as	9865as	11560as	11725as
			11830na	11910na	13695na	17795na
1400	1500		Zambia, 1 Africa-CVC Africa	13590af		
1400	1500	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
1415	1430	mtwhfa	Germany, Pan American Broadcasting	15205as		
1415	1430		Nepal, Radio Nepal	5005as		
1415	1500	Sun	UK, Bible Voice Broadcasting	15265as		
1425	1455	mtwhf	Swaziland, TWR Swaziland	6065af		
1430	1445	Sun	Germany, Pan American Broadcasting	15205as		
1430	1459		China, CNR-2/Business Radio	6055do	6155do	
			7245as	7315as	7335as	7375as
			9820as			
1430	1500	mtwhfa	Albania, Radio Tirana	13625na		
1430	1500		Australia, Radio Australia	9475as	11660as	
1430	1500		China, China Radio International	7325as		
			11695as	12110as		
1430	1500		Sweden, Radio Sweden	13820va		
1445	1500	Sat/Sun	Australia, HCJB Global Voice Australia	15340as		

1500 UTC - 11AM EDT / 10AM CDT / 8AM PDT

1500	1510	mtwhfa	Turkmenistan, Turkmen Radiosi	5015eu		
1500	1515	Sun	UK, Bible Voice Broadcasting	13740as		
1500	1530		Australia, HCJB Global Voice Australia	15340as		
1500	1530	Sun	China, Voice of the Strait	4940do	9505do	
1500	1530		Guam, KSDA/AWR	11720as		
1500	1530		UK, BBC World Service	7405af	11860af	
			15420af			
1500	1530		Vietnam, Voice of Vietnam	7285as	9840as	
			12020as			
1500	1545		USA, WYFR/Family Radio Worldwide	15770sa		
1500	1550		New Zealand, Radio NZ International	6170pa		
1500	1557		Libya, LJB/Voice of Africa	15235af	15240af	
1500	1557		Netherlands, R Netherlands Worldwide	11835as		
			15745as			
1500	1557		North Korea, Voice of Korea	9335eu	11710na	
			13760na	15245eu		
1500	1600		Anguilla, Worldwide Univ Network	11775am		
1500	1600		Australia, ABC NT Alice Springs	2310do		
1500	1600		Australia, ABC NT Katherine	2485do		
1500	1600		Australia, Radio Australia	5995pa	6080pa	
			7240pa	9475as	9590pa	11660as
1500	1600		Bahrain, Radio Bahrain	6010me		
1500	1600	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1500	1600		Canada, CFRX Toronto ON	6070na		
1500	1600		Canada, CFVP Calgary AB	6030na		
1500	1600		Canada, CKZN St Johns NF	6160na		
1500	1600		Canada, CKZU Vancouver BC	6160na		
1500	1600		Canada, Radio Canada International	11675as		
			15125as			
1500	1600		China, China Radio International	5955as		
			6095me	7325as	7410as	9720me
			9870as	9800as	11965eu	13640eu
			13740na	17630as		
1500	1600	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
1500	1600		Malaysia, RTM/Traxx FM	7295do		
1500	1600		Myanmar, Myanma Radio	5985as		
1500	1600		Nigeria, Voice of Nigeria/External Service	15120af		
1500	1600		Papua New Guinea, Radio Wantok Light	7325do		
1500	1600		Russia, Voice of Russia	4975va	9455as	
			9735me	11985va	12040eu	13855af
			11985af			
1500	1600		South Africa, Channel Africa	9625af		
1500	1600	vl	Uganda, Dunamis Shortwave	4750af		
1500	1600		Uganda, UBC Radio	4976do		
1500	1600		UK, BBC World Service	5790eu	5875as	
			6575as	6190af	6195as	7230af
			9740as	11920as	12095eu	15310as
			15400af	17640af	17830af	21470af
1500	1600	DRM	UK, BBC World Service	5790eu	13590eu	
1500	1600		United States, Overcomer Ministries	6110eu		
			13810va	17485eu		
1500	1600		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1500	1600		USA, EWTN/WEWN Vandiver AL	13835as		
1500	1600		USA, Voice of America	4930af	7540va	
			7575va	12080af	12150va	13750va
			15530va	15580af	17895af	
1500	1600		USA, Voice of America/Special English	6140va		
			7520va	9485va	9760va	
1500	1600		USA, WBCQ Monticello ME	9330am		

1500	1600	Sat	USA, WHRI Cypress Creek SC			17510va
1500	1600	Sat/Sun	USA, WHRI Cypress Creek SC			9840na
			11785na			
1500	1600	Sun	USA, WHRI Cypress Creek SC			15195na
1500	1600	vl	USA, WINB Red Lion PA	13570ca		
1500	1600		USA, WJHR International Milton FL			15550usb
1500	1600		USA, WRMI Miami FL	9955na		
1500	1600		USA, WTJC Newport NC	9370na		
1500	1600		USA, WTWW Lebanon TN	9479na		
1500	1600		USA, WWCR Nashville TN	7490af	9980na	
			13845na	15825na		
1500	1600		USA, WWRB Manchester TN	9385na		
1500	1600		USA, WYFR/Family Radio Worldwide			6280as
			11605as	11830na	11910na	15520na
			17580af	17795na		
1500	1600		Zambia, 1 Africa-CVC Africa	13590af		
1500	1600	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
1505	1600	DRM	Canada, Radio Canada International			9800na
1505	1600		Canada, Radio Canada International			9515as
1515	1545	Sat	UK, Bible Voice Broadcasting	13740as		
1525	1600	Sat/Sun	Swaziland, TWR Swaziland	6025af		
1530	1550		Vatican City State, Vatican Radio			13765as
			15235as			
1530	1600		China, Xizang PBS/Holy Tibet	4905do		4920do
			5240do	6110do	6130do	6200do
			7255do	7385do		
1530	1600		Germany, AWR Europe	15255as		
1530	1600		Iran, VOIRI/IRIB	7305as	9600as	
1530	1600		Mongolia, Voice of Mongolia	9665as		12085as
1530	1600		Sweden, Radio Sweden	13870va		13600al
1530	1600	h	UK, Bible Voice Broadcasting	13740as		
1530	1600	Sun	UK, Bible Voice Broadcasting	13590me		
1530	1600		Vatican City State, Vatican Radio			11850as
1545	1600	m	UK, Bible Voice Broadcasting	13590me		
1545	1600	twhfa	UK, Bible Voice Broadcasting	13590me		
1551	1600		New Zealand, Radio NZ International			7440pa
1551	1600	DRM	New Zealand, Radio NZ International			6170pa

1600 UTC - 12PM EDT / 11AM CDT / 9AM PDT

1600	1605	Sun	Croatia, Croatian Radio	6165eu		
1600	1615	mtwhfa	Croatia, Croatian Radio	6165eu		
1600	1615		Pakistan, PBC/Radio Pakistan	7530me		11585af
1600	1615	f	UK, Bible Voice Broadcasting	13590me		
1600	1625	Sat/Sun	Swaziland, TWR Swaziland	6025af		
1600	1627		Czech Republic, Radio Prague			9740eu
1600	1627		Iran, VOIRI/IRIB	7305as	9600as	
1600	1630	Sun	Germany, Pan American Broadcasting			13830me
1600	1630		Guam, KSDA/AWR	11720as		11805as
1600	1630		Myanmar, Myanma Radio	9730do		
1600	1630		Vietnam, Voice of Vietnam	7220me		7280eu
			9550me	9730eu		
1600	1645	h	UK, Bible Voice Broadcasting	13590me		
1600	1645		USA, WYFR/Family Radio Worldwide			11830na
			11865na			
1600	1657		North Korea, Voice of Korea	9990na		11545va
1600	1700		Anguilla, Worldwide Univ Network			11775am
1600	1700		Australia, ABC NT Alice Springs			2310do
1600	1700		Australia, ABC NT Katherine	2485do		
1600	1700		Australia, Radio Australia	5995pa		6080pa
			7240pa	9465as	9710pa	11660as
1600	1700		Bahrain, Radio Bahrain	6010me		
1600	1700	Sat	Canada, CBC NQ SW Service	9625na		
1600	1700		Canada, CFRX Toronto ON	6070na		
1600	1700		Canada, CFVP Calgary AB	6030na		
1600	1700		Canada, CKZN St Johns NF	6160na		
1600	1700		Canada, CKZU Vancouver BC	6160na		
1600	1700		Canada, Radio Canada International			9515as
1600	1700	DRM	Canada, Radio Canada International			9800na
1600	1700		China, China Radio International			6060as
			7235as	7420af	9570af	11900af
			11940eu	11965eu	13760eu	
1600	1700		Egypt, Radio Cairo	12170af		
1600	1700		Ethiopia, Radio Ethiopia/External Service			7165va
			9560af			
1600	1700	mtwhf	France, Radio France Internationale			15605af
			17605af			
1600	1700		Germany, Deutsche Welle	6170as		9485as
			9540as	15410as		
1600	1700		Malaysia, RTM/Traxx FM	7295do		
1600	1700		New Zealand, Radio NZ International			7440pa
1600	1700	DRM	New Zealand, Radio NZ International			6170pa
1600	1700		Papua New Guinea, Radio Wantok Light			7325do
1600	1700		Russia, Voice of Russia	4975va		11985va
			11985af	12040eu	13855af	
1600	1700		South Korea, KBS World Radio			9515eu
1600	1700		Taiwan, Radio Taiwan International			11550as
			13840as			
1600	1700	vl	Uganda, Dunamis Shortwave	4750af		
1600	1700		Uganda, UBC Radio	4976do		
1600	1700		UK, BBC World Service	3255af		5790eu
			5850as	5975as	6190af	9695as
			12095eu	15400af	17640af	17795af
			17830af	21470af		
1600	1700	DRM	UK, BBC World Service	3995eu		5790eu
1600	1700	Sat/Sun	UK, Bible Voice Broadcasting	13590me		
1600	1700		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1600	1700		USA, EWTN/WEWN Vandiver AL			15610va
1600	1700		USA, Voice of America	4930af		6080af
			15580af			
1600	1700		USA, Voice of America/Special English			11890va
			12080va	13570va		
1600	1700		USA, WBCQ Monticello ME	9330am		
1600	1700		USA, WHRI Cypress Creek SC			9840na
			11785na	17520af		
1600	1700	vl	USA, WINB Red Lion PA	13570ca		
1600	1700		USA, WJHR International Milton FL			15550usb
1600	1700		USA, WRMI Miami FL	9955na		
1600	1700		USA, WTJC Newport NC	9370na		
1600	1700		USA, WTWW Lebanon TN	9479na		
1600	1700		USA, WWCR Nashville TN	9980na		12160af
			13845na	15825na		
1600	1700		USA, WWRB Manchester TN	9385na		
1600	1700		USA, WYFR/Family Radio Worldwide			6010af
			6085ca	7270af	11850as	13695na
			17545af	17795na	18980va	21455va
			21525af			
1600	1700		Zambia, 1 Africa-CVC Africa	13590af		
1600	1700	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
1615	1630	mtwhf	Swaziland, TWR Swaziland	6130af		
1615	1630		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu	9645eu	15595va
1615	1700	Sun	UK, BBC World Service	7405af		11860af
			15420af			
1630	1700		Guam, KSDA/AWR	11740as		
1630	1700		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1630	1700		Slovakia, Radio Slovakia International			5920eu
			6055eu			
1630	1700	Sat/Sun	Swaziland, TWR Swaziland	6130af		
1630	1700	Sat	UK, BBC World Service	11860af		
1630	1700	mtwhf	UK, BBC World Service	15420af		
1630	1700		USA, WHRI Cypress Creek SC			9930pa
1640	1650	mtwhfa	Turkmenistan, Turkmen Radiosi			4930eu

1700 UTC - 1PM EDT / 12PM CDT / 10AM PDT

1700	1705		Canada, Radio Canada International			9515as
1700	1705	DRM	Canada, Radio Canada International			9800na
1700	1715	mtwhf	Moldova, (Transnistria) Radio PMR			6240eu
1700	1715		UK, Bible Voice Broadcasting	13590me		
1700	1727		Czech Republic, Radio Prague			9740eu
1700	1730	DRM	Romania, Radio Romania International			7350eu
1700	1730		Sweden, Radio Sweden	13870va		
1700	1730		USA, Voice of America	6080af		12015af
			15580af	17895af		
1700	1730		Vietnam, Voice of Vietnam	9725eu		
1700	1746		UK, BBC World Service	6005af		9410af
1700	1756	DRM	Romania, Radio Romania International			9535eu
1700	1756		Romania, Radio Romania International			11735eu
1700	1759		Canada, Radio Canada International			5850na
1700	1759		Poland, Polskie Radio Warsaw			9770eu
1700	1800		Anguilla, Worldwide Univ Network			11775am
1700	1800		Australia, ABC NT Alice Springs			2310do
1700	1800		Australia, ABC NT Katherine	2485do		
1700	1800		Australia, Radio Australia	5995pa		6080pa
			9475as	9510pa	9710pa	11880pa
1700	1800		Bahrain, Radio Bahrain	6010me		
1700	1800	Sat	Canada, CBC NQ SW Service	9625na		
1700	1800		Canada, CFRX Toronto ON	6070na		
1700	1800		Canada, CFVP Calgary AB	6030na		
1700	1800		Canada, CKZN St Johns NF	6160na		
1700	1800		Canada, CKZU Vancouver BC	6160na		
1700	1800		China, China Radio International			6090as
			6140as	6145eu	6165me	7235as
			7265af	7410as	7420as	9570af
			9695eu	11900af	13760eu	
1700	1800		Egypt, Radio Cairo	12170af		
1700	1800		Equatorial Guinea, Radio Africa			7190af
			15190af			
1700	1800	DRM	Germany, Deutsche Welle	5790eu		

1700	1800		Kuwait, Radio Kuwait	11990va		
1700	1800		Malaysia, RTM/Traxx FM	7295do		
1700	1800		New Zealand, Radio NZ International	7440pa		
1700	1800	DRM	New Zealand, Radio NZ International	6170pa		
1700	1800		Nigeria, Voice of Nigeria/External Service	15120af		
1700	1800		Palau, T8WH/WHRI/Sound of Hope Radio 9930va			
1700	1800		Papua New Guinea, Radio Wantok Light	7325do		
1700	1800	DRM	Poland, Polskie Radio Warsaw	7265eu		
1700	1800		Russia, Voice of Russia	4975va	11985va	
			12040eu	13855af		
1700	1800		South Africa, Channel Africa	9675af		
1700	1800		Swaziland, TWR Swaziland	3200af	9500af	
1700	1800		Taiwan, Radio Taiwan International	15690af		
1700	1800		Tajikistan, Voice of Tajik/External Service	7245va		
1700	1800	vl	Uganda, Dunamis Shortwave	4750af		
1700	1800		Uganda, UBC Radio	4976do		
1700	1800		UK, BBC World Service	3255af	5790eu	
			5850as	5875eu	5975as	6190af
			7405af	9810as	12095af	13675eu
			15400af	17795af	17830af	
1700	1800	DRM	UK, BBC World Service	3995eu		
1700	1800	Sat	UK, Bible Voice Broadcasting	9645me		
1700	1800	Sat/Sun	UK, Bible Voice Broadcasting	13590me		
1700	1800		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1700	1800		USA, EWTN/WEWN Vandiver AL	15610va		
1700	1800		USA, WBCQ Monticello ME	9330am	15420usb	
1700	1800	mtwhfs	USA, WHRI Cypress Creek SC	9840na		
1700	1800	Sat	USA, WHRI Cypress Creek SC	17520am		
1700	1800		USA, WHRI Cypress Creek SC	11785na		
			17520af			
1700	1800	vl	USA, WINB Red Lion PA	13570ca		
1700	1800		USA, WJHR International Milton FL	15550usb		
1700	1800		USA, WRMI Miami FL	9955ca		
1700	1800		USA, WTJC Newport NC	9370na		
1700	1800		USA, WTWW Lebanon TN	9479na		
1700	1800		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1700	1800		USA, WWRB Manchester TN	9385na		
1700	1800		USA, WYFR/Family Radio Worldwide	7395af		
			11810af	13690na	17545af	17795na
			18980va	21455va		
1700	1800		Zambia, 1 Africa-CVC Africa	13590af		
1720	1740	Sat/Sun	USA, Voice of America/Studio 7	4930af		
			11605af	15775af		
1730	1740	fas	USA, Voice of America	4930af	11605af	
			15775af			
1730	1800		Bulgaria, Radio Bulgaria	5900eu	7400eu	
1730	1800	DRM	Bulgaria, Radio Bulgaria	9400eu		
1730	1800		Clandestine, Sudan Radio Service/ SRS	9590af		
1730	1800		UK, Bible Voice Broadcasting	13590me		
1730	1800	Sun	UK, Bible Voice Broadcasting	9645me		
1730	1800		USA, Voice of America	12015af	15580af	
			17895af			
1730	1800	mtwhf	USA, Voice of America/Studio 7	4930af		
			11605af	15775af		
1730	1800		Vatican City State, Vatican Radio	11625af		
			13765af	15570af		
1745	1800		Bangladesh, Bangladesh Betar	7250as		
1745	1800	DRM	India, All India Radio	9950eu		
1745	1800		India, All India Radio	6120af	6280eu	
			7400af	7410af	7550eu	9415af
			9445af	9940eu	11935af	
1745	1800	mtwhf	Moldova, (Transnistria) Radio PMR	6240na		

1800 UTC - 2PM EDT / 1PM CDT / 11AM PDT

1800	1810	Sun	UK, Bible Voice Broadcasting	13590me		
1800	1830	w	Austria, AWR Europe	9755af		
1800	1830		South Africa, AWR 3215af	3345af	9610af	
1800	1830		UK, BBC World Service	5875as	5975as	
1800	1830	Sun	UK, Bible Voice Broadcasting	9430me		
1800	1830		USA, Voice of America	6080af	9850af	
			12015af	15580af		
1800	1830	fa	USA, Voice of America	4930af	11605af	
			15775af			
1800	1835		New Zealand, Radio NZ International	7440pa		
1800	1835	DRM	New Zealand, Radio NZ International	6170pa		
1800	1857		Netherlands, R Netherlands Worldwide	6020af		
1800	1857		North Korea, Voice of Korea	13760af	15245eu	
1800	1859		Canada, Radio Canada International	9530af		
			11765af	17735af	17810af	
1800	1900		Anguilla, Worldwide Univ Network	11775am		
1800	1900	mtwhf	Argentina, Radio Nacional RAE	9690eu		
			15345eu			
1800	1900		Australia, ABC NT Alice Springs	2310do		
1800	1900		Australia, ABC NT Katherine	2485do		
1800	1900		Australia, Radio Australia	6080pa	7240pa	
			9475as	9510pa	9710pa	11880pa
1800	1900		Bahrain, Radio Bahrain	6010me		
1800	1900		Bangladesh, Bangladesh Betar	7250eu		
1800	1900		Canada, CFRX Toronto ON	6070na		
1800	1900		Canada, CFVP Calgary AB	6030na		
1800	1900		Canada, CKZN St Johns NF	6160na		
1800	1900		Canada, CKZU Vancouver BC	6160na		
1800	1900		China, China Radio International	9600eu		
			13760eu			
1800	1900		Equatorial Guinea, Radio Africa	7190af		
			15190af			
1800	1900	DRM	Germany, Deutsche Welle	5790eu		
1800	1900	DRM	India, All India Radio	9950eu		
1800	1900		India, All India Radio	6120af	6280eu	
			7400af	7410af	7550eu	9415af
			9445af	11935af		
1800	1900		Kuwait, Radio Kuwait	15540va		
1800	1900		Liberia, Star Radio	4025af		
1800	1900		Malaysia, RTM/Traxx FM	7295do		
1800	1900		Netherlands, R Netherlands Worldwide	12045af		
			15535af			
1800	1900		Nigeria, Voice of Nigeria/External Service	15120af		
1800	1900		Palau, T8WH/WHRI/Sound of Hope Radio 9930va	9955as		
1800	1900		Papua New Guinea, Radio Wantok Light	7325do		
1800	1900		Russia, Voice of Russia	4975va	12040eu	
1800	1900		South Korea, KBS World Radio	7275eu		
1800	1900		Taiwan, Radio Taiwan International	6155eu		
1800	1900	vl	Uganda, Dunamis Shortwave	4750af		
1800	1900		Uganda, UBC Radio	4976do		
1800	1900		UK, BBC World Service	3255af	5790eu	
			5875eu	5950as	6190af	7405af
			11810af	12095af	13675af	15400af
			17795af			
1800	1900	Sat	UK, Bible Voice Broadcasting	9430me		
1800	1900	Sun	UK, Bible Voice Broadcasting	6130eu		
1800	1900		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1800	1900		USA, EWTN/WEWN Vandiver AL	15610va		
1800	1900		USA, KJES Vado NM	15385pa		
1800	1900		USA, KJES Vado NM	15385pa		
1800	1900		USA, WBCQ Monticello ME	7415usb	9330am	
			15420usb			
1800	1900		USA, WHRI Cypress Creek SC	9840na		
			9955na	11785na	17520af	
1800	1900	vl	USA, WINB Red Lion PA	13570ca		
1800	1900		USA, WJHR International Milton FL	15550usb		
1800	1900		USA, WRMI Miami FL	9955ca		
1800	1900		USA, WTJC Newport NC	9370na		
1800	1900		USA, WTWW Lebanon TN	9479na		
1800	1900		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1800	1900		USA, WWRB Manchester TN	9385na		
1800	1900		USA, WYFR/Family Radio Worldwide	6180af		
			7395af	9770af	13615na	13690na
			13750af	17795na	17845af	18980va
1800	1900		Yemen, Republic of Yemen Radio/Radio Sana'a			
			6005me	9780me		
1800	1900		Zambia, 1 Africa-CVC Africa	13590af		
1805	1810	Sat	Croatia, Croatian Radio	6165eu		
1805	1815	mtwhf	Croatia, Croatian Radio	6165eu		
1830	1845		Rwanda, Radio Rwanda	6055do		
1830	1845	Sat	UK, Bible Voice Broadcasting	6130eu		
1830	1900		Serbia, International Radio of Serbia	6100eu		
1830	1900		Slovakia, Radio Slovakia International	5920eu		
			6055eu			
1830	1900		Turkey, Voice of Turkey	9785eu		
1830	1900		UK, BBC World Service	5875as	6005af	
			9410af			
1830	1900	f	UK, Bible Voice Broadcasting	9430me		
1830	1900		USA, Voice of America	4930af	6080af	
			9850af	12015af	15580af	
1830	1900	Sat	USA, WHRI Cypress Creek SC	11785na		
1836	1900		New Zealand, Radio NZ International	9615pa		
1836	1900	DRM	New Zealand, Radio NZ International	9890pa		
1845	1900	mtwhas	Albania, Radio Tirana	7520eu	13640na	
1845	1900	Sun	UK, Bible Voice Broadcasting	11830af		
1859	1900		Netherlands, R Netherlands Worldwide	7425af		
			11610af	11970af		

1900 UTC - 3PM EDT / 2PM CDT / 12PM PDT

1900	1915	Sun	UK, Bible Voice Broadcasting	11830af		
1900	1930		Germany, Deutsche Welle	6150af	11795af	
			17865af			

1900	1930		Turkey, Voice of Turkey	9785eu		
1900	1930		USA, Voice of America	4930af	4940af	
			6080af	9850af	15580af	17895af
1900	1930		Vietnam, Voice of Vietnam	7280eu	9730eu	
1900	1935	DRM	New Zealand, Radio NZ International	9890pa		
1900	1945	DRM	India, All India Radio	9950eu		
1900	1945		India, All India Radio	6120af	6280eu	
			7400af	7410af	7550eu	9415af
			9445af	11935af		
1900	1945		USA, WYFR/Family Radio Worldwide	6085ca		
1900	1950		New Zealand, Radio NZ International	9615pa		
1900	1957		Netherlands, R Netherlands Worldwide	7425af		
			12045af	15535af		
1900	1957		North Korea, Voice of Korea	7100eu	9975af	
			11535va	11910af		
1900	2000		Anguilla, Worldwide Univ Network	11775am		
1900	2000		Australia, ABC NT Alice Springs	2310do		
1900	2000		Australia, ABC NT Katherine	2485do		
1900	2000		Australia, Radio Australia	6080pa	7240pa	
			9500as	9510pa	9710pa	11880pa
1900	2000		Bahrain, Radio Bahrain	6010me		
1900	2000	DRM	Belgium, TDP Radio	15755na		
1900	2000		Canada, CFRX Toronto ON	6070na		
1900	2000		Canada, CFVP Calgary AB	6030na		
1900	2000		Canada, CKZN St Johns NF	6160na		
1900	2000		Canada, CKZU Vancouver BC	6160na		
1900	2000		China, China Radio International	7295af		
			9435af			
1900	2000		Egypt, Radio Cairo	11510af		
1900	2000		Equatorial Guinea, Radio Africa	7190af		
			15190af			
1900	2000	DRM	Germany, Deutsche Welle	3995eu	5875eu	
1900	2000		Kuwait, Radio Kuwait	15540va	17550va	
1900	2000		Liberia, Star Radio	4025af		
1900	2000		Malaysia, RTM/Traxx FM	7295do		
1900	2000		Netherlands, R Netherlands Worldwide	11610af		
			11970af			
1900	2000		Nigeria, Voice of Nigeria/External Service	9690af		
			7255al			
1900	2000		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1900	2000		Papua New Guinea, Radio Wantok Light	7325do		
1900	2000		Russia, Voice of Russia	12040eu		
1900	2000	mtwhf	Spain, Radio Exterior de Espana	9665af		
			11620eu			
1900	2000		Thailand, Radio Thailand World Service	7570eu		
1900	2000		Uganda, UBC Radio	4976do		
1900	2000		UK, BBC World Service	3255af	3995eu	
			5875eu	5950as	6005af	6155as
			6190af	9410af	11810af	12095af
			15400af	17795af		
1900	2000		Ukraine, Radio Ukraine International	7440na		
1900	2000		United States, Overcomer Ministries	6155eu		
			7425me			
1900	2000		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1900	2000		USA, EWTN/WEWN Vandiver AL	15610va		
1900	2000		USA, Voice of America/Special English	7485va		
			9630va			
1900	2000		USA, WBCQ Monticello ME	7415usb	9330am	
			15420usb			
1900	2000		USA, WHRI Cypress Creek SC	9840na		
			11785na	15665af		
1900	2000	vl	USA, WINB Red Lion PA	13570ca		
1900	2000		USA, WJHR International Milton FL	15550usb		
1900	2000		USA, WRMI Miami FL	9955ca		
1900	2000		USA, WTJC Newport NC	9370na		
1900	2000		USA, WTWW Lebanon TN	9479na		
1900	2000		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1900	2000		USA, WWRB Manchester TN	9385na		
1900	2000		USA, WYFR/Family Radio Worldwide	3230af		
			6020af	7270af	7395af	9610af
			9775af	13615af	13690na	17795na
			17845af	18930va	18980va	
1900	2000		Zambia, 1 Africa-CVC Africa	9540af		
1905	1920	Sat	Mali, ORTM Du Mali	5995do		
1905	2000	m	South Africa, Amateur Radio Mirror Intl	3215af		
1930	2000	Sat/Sun	Germany, Pan American Broadcasting	6175af		
1930	2000		Iran, VOIRI/IRIB	5940eu	6205eu	7205eu
			7215af	9800af		
1930	2000	vl	South Africa, RTE Radio Worldwide	6225af		
1930	2000		USA, Voice of America	4930af	4940af	
			6080af	9850af	15580af	
1936	2000	DRM	New Zealand, Radio NZ International	11675pa		
1945	2000	DRM	Vatican City State, Vatican Radio	9800am		
1950	2000		Vatican City State, Vatican Radio	4005eu		
			5885eu	7250eu	9645eu	
1951	2000		New Zealand, Radio NZ International	11725pa		

2000 UTC - 4PM EDT / 3PM CDT / 1PM PDT

2000	2005	m	South Africa, Amateur Radio Mirror Intl	3215af		
2000	2015	Sun	Germany, Pan American Broadcasting	6175af		
2000	2020		Vatican City State, Vatican Radio	4005eu		
			5885eu	7250eu	9645eu	
2000	2027		Czech Republic, Radio Prague	5930eu		
2000	2027		Iran, VOIRI/IRIB	5940eu	6205eu	7205eu
			7215af	9800af		
2000	2030	mtwhfa	Albania, Radio Tirana	7465eu	13640na	
2000	2030		Egypt, Radio Cairo	11510af		
2000	2030	Sat	Germany, Pan American Broadcasting	6175af		
2000	2030	vl	South Africa, RTE Radio Worldwide	6225af		
2000	2030		Swaziland, TWR Swaziland	3200af		
2000	2030		USA, Voice of America	4930af	4940af	
			6080af	15580af		
2000	2030	DRM	Vatican City State, Vatican Radio	9800am		
2000	2030		Vatican City State, Vatican Radio	7365af		
			9755af	11625af		
2000	2045		USA, WYFR/Family Radio Worldwide	17750eu		
2000	2050	DRM	New Zealand, Radio NZ International	11675pa		
2000	2056		Romania, Radio Romania International	9690na		
			11880eu	11940na		
2000	2057		Germany, Deutsche Welle	6150af	11795af	
			11865af			
2000	2057		Netherlands, R Netherlands Worldwide	7425af		
			11610af	11970af		
2000	2059		Canada, Radio Canada International	15235af		
			17735af			
2000	2100		Anguilla, Worldwide Univ Network	11775am		
2000	2100		Australia, ABC NT Alice Springs	2310do		
2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek	2325do		
2000	2100		Australia, Radio Australia	6080pa	11650pa	
			11660pa	11880pa		
2000	2100	Sat/Sun	Australia, Radio Australia	6080pa	7240pa	
			12080pa			
2000	2100		Bahrain, Radio Bahrain	6010me		
2000	2100		Belarus, Radio Belarus	7255eu	7360eu	
			7390eu			
2000	2100	DRM	Belgium, TDP Radio/Disco Palace	15755na		
2000	2100		Canada, CFRX Toronto ON	6070na		
2000	2100		Canada, CFVP Calgary AB	6030na		
2000	2100		Canada, CKZN St Johns NF	6160na		
2000	2100		Canada, CKZU Vancouver BC	6160na		
2000	2100		China, China Radio International	5960eu		
			5985af	7285eu	7295af	7415eu
			9440af	9600eu		
2000	2100		Cuba, Radio Havana Cuba	11760ca		
2000	2100		Equatorial Guinea, Radio Africa	7190af		
			15190af			
2000	2100		Indonesia, Voice of Indonesia	9526va	11785al	
2000	2100		Kuwait, Radio Kuwait	15540va	17550va	
2000	2100		Liberia, Star Radio	4025af		
2000	2100		Malaysia, RTM/Traxx FM	7295do		
2000	2100		New Zealand, Radio NZ International	11725pa		
2000	2100		Nigeria, Voice of Nigeria/External Service	15120af		
2000	2100		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
2000	2100		Syria, Radio Damascus	9330eu	12085as	
2000	2100		Uganda, UBC Radio	4976do		
2000	2100		Uganda, UBC Radio	4976do		
2000	2100		UK, BBC World Service	3255af	5875eu	
			6005af	6190af	9410af	11810af
			12095af	13820af	15400af	
2000	2100		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2000	2100		USA, EWTN/WEWN Vandiver AL	15610va		
2000	2100		USA, WBCQ Monticello ME	7415usb	9330am	
			15420usb			
2000	2100		USA, WHRI Cypress Creek SC	11785na		
			13660eu	15665af		
2000	2100	vl	USA, WINB Red Lion PA	13570ca		
2000	2100		USA, WJHR International Milton FL	15550usb		
2000	2100		USA, WRMI Miami FL	9955ca		
2000	2100		USA, WTJC Newport NC	9370na		
2000	2100		USA, WTWW Lebanon TN	9479na		
2000	2100		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
2000	2100		USA, WWRB Manchester TN	9385na		
2000	2100		USA, WYFR/Family Radio Worldwide	7430eu		
			9450af	9510af	9610af	9740af
			11690af	12055af	13615sa	17725af
			17795va	17845va	18980va	
2000	2100		Zambia, 1 Africa-CVC Africa	9540af		
2030	2045		Thailand, Radio Thailand World Service	9680eu		
2030	2056	DRM	Romania, Radio Romania International	9765eu		

2030	2100		Sweden, Radio Sweden	9495va		
2030	2100		Turkey, Voice of Turkey	7205va		
2030	2100		USA, Voice of America	4930af	6080af	
			7355af	15580af		
2030	2100	fa	USA, Voice of America	4940af		
2030	2100		Vietnam, Voice of Vietnam	7280eu	9550me	
2045	2100		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2045	2100	DRM	India, All India Radio	9950eu		

2100 UTC - 5PM EDT / 4PM CDT / 2PM PDT

2100	2105		Uganda, UBC Radio	4976do		
2100	2130		Australia, ABC NT Alice Springs		2310do	
2100	2130		Australia, ABC NT Alice Springs		2310do	
2100	2130		Australia, ABC NT Katherine	2485do		
2100	2130		Australia, ABC NT Tennant Creek		2325do	
2100	2130		Austria, AWR Europe	11955af		
2100	2130	Sat	Canada, CBC NQ SW Service	9625na		
2100	2130		Cuba, Radio Havana Cuba	11760ca		
2100	2130		Serbia, International Radio of Serbia		6100eu	
2100	2130		South Korea, KBS World Radio		3955eu	
2100	2130		Turkey, Voice of Turkey	7205va		
2100	2145		USA, WYFR/Family Radio Worldwide		13615na	
			13690na	17795na	18980va	
2100	2150		New Zealand, Radio NZ International		11725pa	
2100	2150	DRM	New Zealand, Radio NZ International		11675pa	
2100	2157		Germany, Deutsche Welle	9735as	11865af	
			15640af			
2100	2157		North Korea, Voice of Korea	13760va	15245eu	
2100	2200		Anguilla, Worldwide Univ Network		11775am	
2100	2200		Australia, Radio Australia	9500as	9660pa	
			11650pa	11660pa	11695as	12080pa
			13630pa	15515pa		
2100	2200		Bahrain, Radio Bahrain	6010me		
2100	2200		Belarus, Radio Belarus	7255eu	7360as	
			7390eu			
2100	2200		Bulgaria, Radio Bulgaria	5900eu	7400eu	
2100	2200		Canada, CFRX Toronto ON	6070na		
2100	2200		Canada, CFVP Calgary AB	6030na		
2100	2200		Canada, CKZN St Johns NF	6160na		
2100	2200		Canada, CKZU Vancouver BC	6160na		
2100	2200	DRM	Canada, Radio Canada International		9800na	
2100	2200		China, China Radio International		5960eu	
			7205af	7285eu	7325af	7415eu
			9600eu			
2100	2200		Equatorial Guinea, Radio Africa		7190af	
			15190af			
2100	2200		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2100	2200	DRM	India, All India Radio	9950eu		
2100	2200		Malaysia, RTM/Traxx FM	7295do		
2100	2200		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
2100	2200	Sat/Sun	Spain, Radio Exterior de Espana		9650eu	
2100	2200		Syria, Radio Damascus	9330va	12085va	
2100	2200	DRM	UK, BBC World Service	3995eu		
2100	2200		UK, BBC World Service	3255af	3915as	
			5790eu	5875as	5905as	6005af
			6190af	6195as	7405af	9915af
			12095af			
2100	2200		Ukraine, Radio Ukraine International		6145na	
2100	2200		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2100	2200		USA, EWTN/WEWN Vandiver AL		15610va	
2100	2200		USA, Voice of America	6080af	15580af	
2100	2200		USA, WBCQ Monticello ME	7415usb	9330am	
			15420usb			
2100	2200		USA, WHRI Cypress Creek SC		9690eu	
			11785na	13660eu		
2100	2200	vl	USA, WINB Red Lion PA	13570ca		
2100	2200		USA, WJHR International Milton FL		15550usb	
2100	2200		USA, WRMI Miami FL	9955ca		
2100	2200		USA, WTJC Newport NC	9370na		
2100	2200		USA, WTWW Lebanon TN	9479na		
2100	2200		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2100	2200		USA, WWRB Manchester TN	3215na	9385na	
2100	2200		USA, WYFR/Family Radio Worldwide		7425af	
			9450af	9740af	12055af	17845af
2100	2200		Zambia, 1 Africa-CVC Africa	9540af		
2115	2145		Egypt, Radio Cairo	6270eu		
2130	2157		Czech Republic, Radio Prague		9410af	
2130	2200		Australia, ABC NT Alice Springs		4835do	
2130	2200		Australia, ABC NT Katherine	5025do		
2130	2200	mtwhfa	Canada, CBC NQ SW Service	9625na		
2130	2200		China, China Radio International		7365eu	
2130	2200		Guam, KSDA/AWR	11850as		
2130	2200		Netherlands, R Netherlands Worldwide		7460af	
2130	2200		Sweden, Radio Sweden	7460va		

2200 UTC - 6PM EDT / 5PM CDT / 3PM PDT

2200	2230		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2200	2230	DRM	India, All India Radio	9950eu		
2200	2245		Egypt, Radio Cairo	6270eu		
2200	2245		USA, WYFR/Family Radio Worldwide		15770af	
2200	2256		Romania, Radio Romania International		5960as	
			7435va	9790eu	11940as	
2200	2300		Anguilla, Worldwide Univ Network		6090am	
2200	2300		Australia, ABC NT Alice Springs		4835do	
2200	2300		Australia, ABC NT Katherine	5025do		
2200	2300		Australia, Radio Australia	9660pa	11695as	
			11875as	12080pa	13630pa	15230pa
			15240as	15415as	15515pa	15560pa
2200	2300		Bahrain, Radio Bahrain	6010me		
2200	2300	smtwhf	Canada, CBC NQ SW Service	9625na		
2200	2300		Canada, CFRX Toronto ON	6070na		
2200	2300		Canada, CFVP Calgary AB	6030na		
2200	2300		Canada, CKZN St Johns NF	6160na		
2200	2300		Canada, CKZU Vancouver BC	6160na		
2200	2300		China, China Radio International		9590as	
2200	2300		Equatorial Guinea, Radio Africa		7190af	
			15190af			
2200	2300		Malaysia, RTM/Traxx FM	7295do		
2200	2300		New Zealand, Radio NZ International		13730pa	
2200	2300	DRM	New Zealand, Radio NZ International		15720pa	
2200	2300		Russia, Voice of Russia	9890na		
2200	2300		Syria, Radio Damascus	9330va	12085va	
2200	2300		Turkey, Voice of Turkey	9830va		
2200	2300		UK, BBC World Service	3915as	5905as	
			5935af	6195as	7490as	9440as
			9740as	9915af	12095af	
2200	2300	DRM	UK, BBC World Service	3995eu		
2200	2300		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2200	2300		USA, EWTN/WEWN Vandiver AL		11520va	
2200	2300	mtwhf	USA, Voice of America	5895va	7460va	
			7575va	11955va		
2200	2300		USA, WBCQ Monticello ME	5110usb	7415usb	
			9330am			
2200	2300		USA, WHRI Cypress Creek SC		9785af	
			11785na			
2200	2300	vl	USA, WINB Red Lion PA	9265ca		
2200	2300		USA, WJHR International Milton FL		15550usb	
2200	2300		USA, WRMI Miami FL	9955ca		
2200	2300		USA, WTJC Newport NC	9370na		
2200	2300		USA, WTWW Lebanon TN	9479na		
2200	2300		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2200	2300		USA, WWRB Manchester TN	3215na	9385va	
2200	2300		USA, WYFR/Family Radio Worldwide		5950na	
			11740na	15440na		
2215	2230		Croatia, Croatian Radio	3985eu	9925ca	
2230	2257		Czech Republic, Radio Prague		9440na	
2230	2300		China, Xizang PBS/Holy Tibet	4905do	4920do	
			5240do	6110do	6130do	6200do
			7255do	7385do		
2230	2300		Guam, KSDA/AWR	15320as		
2230	2300		USA, Voice of America	11840as		
2230	2300		USA, Voice of America/Special English		9570va	
			11840va	15145va		
2245	2300		India, All India Radio	6055as	7305as	
			9705as	9705as	9950as	11645as
			13605as			

2300 UTC - 7PM EDT / 6PM CDT / 4PM PDT

2300	0000		Anguilla, Worldwide Univ Network		6090am	
2300	0000		Australia, ABC NT Alice Springs		4835do	
2300	0000		Australia, ABC NT Katherine	5025do		
2300	0000		Australia, Radio Australia	9660pa	11875as	
			12080pa	13690pa	15560pa	17750as
2300	0000		Bahrain, Radio Bahrain	6010me		
2300	0000		Bulgaria, Radio Bulgaria	9700na	11700na	
2300	0000	smtwhf	Canada, CBC NQ SW Service	9625na		
2300	0000		Canada, CFRX Toronto ON	6070na		
2300	0000		Canada, CFVP Calgary AB	6030na		
2300	0000		Canada, CKZN St Johns NF	6160na		
2300	0000		Canada, CKZU Vancouver BC	6160na		
2300	0000		China, China Radio International		5915as	
			5990ca	6145na	7350eu	7410as
			9610as	11690pa	11790as	11840na

2300	0000		Cuba, Radio Havana Cuba	5040na		
2300	0000		Egypt, Radio Cairo	11590na		
2300	0000	vl	Guyana, Voice of Guyana	3290va		
2300	0000		India, All India Radio	6055as	7305as	
			9705as	9705as	9950as	11645as
			13605as			
2300	0000		Malaysia, RTM/Traxx FM	7295do		
2300	0000		New Zealand, Radio NZ International		13730pa	
2300	0000	DRM	New Zealand, Radio NZ International		15720pa	
2300	0000		Russia, Voice of Russia	9890na		
2300	0000		UK, BBC World Service	3915as	6195as	
			7490as	9740as	9890as	11850as
			12010as			
2300	0000		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2300	0000		USA, EWTN/WEWN Vandiver AL		11520va	
2300	0000		USA, Voice of America	5895va	7575va	
			11955va	13805as		
2300	0000		USA, WBCQ Monticello ME	5110usb	7415usb	
			9330am			
2300	0000		USA, WHRI Cypress Creek SC		7315na	
2300	0000	Sat	USA, WHRI Cypress Creek SC		9690am	
2300	0000	smtwhf	USA, WHRI Cypress Creek SC		5920am	
2300	0000	vl	USA, WINB Red Lion PA	9265ca		
2300	0000		USA, WJHR International Milton FL		15550usb	
2300	0000		USA, WRMI Miami FL	9955ca		
2300	0000		USA, WTJC Newport NC	9370na		
2300	0000		USA, WTWW Lebanon TN	9479na		
2300	0000		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2300	0000		USA, WWRB Manchester TN	9385na	6890va	
2300	0000		USA, WYFR/Family Radio Worldwide		5950na	
			11580sa	15655sa	15440na	
2300	2330		Australia, Radio Australia	11695as	15240as	
			17795pa			
2300	2330		USA, Voice of America/Special English		9570as	
			13805va	15145va		
2300	2330	DRM	Vatican City State, Vatican Radio		9755am	
2300	2345		USA, WYFR/Family Radio Worldwide		11740na	
2305	0000		Canada, Radio Canada International		6100na	
2330	0000		UK, BBC World Service	9580as		
2330	0000		USA, Voice of America/Special English		7460as	
			9570va	13805va	15145va	15340va
2330	0000		Vietnam, Voice of Vietnam	9840as	12020as	

MT SHORTWAVE STATION RESOURCE GUIDE

Albania, Radio Tirana ..... **http://rtsh.sil.at/**
Anguilla, Worldwide Univ Network ..... **www.worldwideuniversitynetwork.com/**
Argentina, Radio Nacional RAE..... **www.radionacional.com.ar/**
Australia, ABC NT Alice Springs..... **www.abc.net.au/radio/**
Australia, ABC NT Katherine..... **www.abc.net.au/radio/**
Australia, ABC NT Tennant Creek ..... **www.abc.net.au/radio/**
Australia, HCJB Global Voice Australia..... **www.hcjb.org/**
Australia, Radio Australia ..... **www.abc.net.au/ra/**
Austria, AWR Europe **www.awr2.org/**
Bahrain, Radio Bahrain ..... **www.radiobahrain.fm/**
Bangladesh, Bangladesh Betar ..... **www.betar.org.bd/**
Belarus, Radio Belarus ..... **www.radiobelarus.tvr.by/eng/**
Belgium, TDP Radio ..... **www.airtime.be/schedule.html**
Belgium, TDP Radio/Disco Palace ..... **www.airtime.be/schedule.html**
Bhutan, Bhutan Broadcasting Service ..... **www.bbs.com.bt/**
Bulgaria, Radio Bulgaria ..... **www.bnr.bg/**
Canada, CBC NQ SW Service..... **www.cbc.ca/north/**
Canada, CFRX Toronto ON..... **www.cfrb.com**
Canada, CFVP Calgary AB..... **www.classiccountryam1060.com**
Canada, CKZN St Johns NF..... **www.cbc.ca/listen/index.html**
Canada, CKZU Vancouver BC..... **www.cbc.ca/bc**
Canada, Radio Canada International ..... **www.rcinet.ca/**
China, China Radio International ..... **www.cri.cn/**
China, Voice of the Strait..... **www.vos.com.cn**
Clandestine, Cotton Tree News..... **www.cottontreenews.org/**
Clandestine, Sudan Radio Service/ SRS .... **www.sudanradio.org/**
Croatia, Croatian Radio ..... **www.hrt.hr/**
Cuba, Radio Havana Cuba ..... **www.radiohc.cu/**
Czech Republic, Radio Prague ..... **www.radio.cz/**
Egypt, Radio Cairo..... **www.sis.gov.eg/**
Ethiopia, Radio Ethiopia/External Service.. **www.erta.gov.et**
France, Radio France Internationale..... **http://rfienglish.com**
Germany, AWR Europe..... **www.awr2.org/**
Germany, Blue Star Radio ..... **www.mvbalticradio.de**
Germany, Deutsche Welle ..... **www.dw-world.de/**
Germany, European Music Radio..... **www.emr.org.uk/**
Germany, Pan American Broadcasting ..... **www.radiopanam.com/**
Germany, Radio Gloria International ..... **www.radiopanam.com/**
Germany, TWR Europe..... **www.twr.org**
Greece, Voice of Greece ..... **www.voiceofgreece.gr/**
Greece, Voice of Greece/Radio Filia..... **www.voiceofgreece.gr/**
Guam, KSDA/AWR **www.awr2.org/**
Guam, KTWR/TWR..... **www.twr.org/**
Guyana, Voice of Guyana ..... **www.voiceofguyana.com/**
India, All India Radio ..... **www.allindiaradio.org/**
Indonesia, Voice of Indonesia ..... **www.voi.co.id**
Iran, VOIRI/IRIB ..... **www.irib.ir/English/**
Japan, NHK World/ Radio Japan..... **www.nhk.or.jp/english/**
Kuwait, Radio Kuwait..... **www.media.gov.kw/**
Laos, Lao National Radio ..... **www.lnr.org.la**
Liberia, Star Radio ..... **www.starradio.org.lr/**
Libya, LJB/Voice of Africa ..... **www.voiceofafrica.com.ly**
Malaysia, RTM/Traxx FM..... **www.traxxfm.net/index.php**
Malaysia, RTM/Voice of Malaysia..... **www.rtm.gov.my**
Mali, ORTM Du Mali ..... **www.ortm.ml**
Monaco, TWR Europe ..... **www.twr.org/**
Mongolia, Voice of Mongolia..... **www.mnb.mn**
Nepal, Radio Nepal ..... **www.radionepal.org/**
Netherlands, R Netherlands Worldwide .... **www.radionepal.org/**
New Zealand, Radio NZ International ..... **www.rnzi.com**
Nigeria, Voice of Nigeria/External Service **www.voiceofnigeria.org**
Oman, Radio Sultanate of Oman ..... **www.oman-tv.gov.om**
Pakistan, PBC/Radio Pakistan..... **www.radio.gov.pk**
Palau, T8WH/WHRI/Sound of Hope Radio **www.whr.org/**
Philippines, FEBC..... **www.febc.ph**
Philippines, PBS/ Radyo Pilipinas..... **www.pbs.gov.ph/**
Poland, Polskie Radio Warsaw ..... **www.polskieradio.pl**
Romania, Radio Romania International .... **www.rri.ro/**
Russia, Voice of Russia ..... **www.ruvr.ru/**
Rwanda, Radio Rwanda ..... **www.orinfor.gov.rw/radiorwanda.eng.html**
Saudi Arabia, BSKSA/Saudi Radio..... **www.saudiradio.net/**
Serbia, International Radio of Serbia..... **www.glassrbije.org**
Slovakia, IRRS/Euro Gospel Radio..... **www.nexus.org**
Slovakia, IRRS/Radio City ..... **www.nexus.org**
Slovakia, IRRS/Radio Joystick ..... **www.nexus.org**
Slovakia, Radio Slovakia International..... **www.rsi.sk**
South Africa, Amateur Radio Mirror Intl .... **www.sarl.org.za**
South Africa, AWR..... **www.awr2.org/**
South Africa, Channel Africa..... **www.channelafrica.org**
South Africa, RTE Radio Worldwide **www.rte.ie/radio1/**
South Africa, TWR Africa..... **www.twr.org/**
South Korea, KBS World Radio ..... **http://rki.kbs.co.kr/english/**
Spain, Radio Exterior de Espana ..... **www.ree.rne.es/**
Sri Lanka, SLBC ..... **www.slbc.lk**
Swaziland, TWR Swaziland ..... **www.twrafrica.org**
Sweden, Radio Sweden ..... **www.sr.se/rs/english/**
Syria, Radio Damascus..... **www.rtv.gov.sy/**
Taiwan, Radio Taiwan International ..... **http://english.rti.org.tw/**
Thailand, Radio Thailand World Service ... **www.hsk9.com/**
Turkey, Voice of Turkey..... **www.trt.net.tr**
Uganda, Dunamis Shortwave ..... **www.biblevoice.org/stations/east-africa**
Uganda, UBC Radio ..... **www.ubconline.co.ug**
UK, BBC World Service..... **www.bbc.co.uk/worldservice/**
UK, Bible Voice Broadcasting..... **www.biblevoice.org/**
Ukraine, Radio Ukraine International ..... **www.nrcu.gov.ua/**
United Arab Emirates, FEBA Radio ..... **www.febaradio.info**
United States, Overcomer Ministries..... **www.overcomerministry.org/**
USA, American Forces Network ..... **http://myafn.dodmedia.osd.mil/**
USA, EWTN/WEWN Vandiver AL ..... **www.ewtn.com**
USA, KNLS Anchor Point AK..... **www.knls.org/**
USA, Voice of America ..... **www.voanews.com/**
USA, Voice of America/Special English..... **www.voanews.com/**
USA, Voice of America/Studio 7..... **www.voanews.com/**
USA, WBCQ Monticello ME..... **www.wbcq.com/**
USA, WHRI Cypress Creek SC ..... **www.whr.org/**
USA, WINB Red Lion PA ..... **www.winb.com/**
USA, WRMI Miami FL..... **www.wrmi.net/**
USA, WRNO New Orleans LA ..... **www.wrnoworldwide.org/**
USA, WTJC Newport NC..... **www.fbnradio.com/**
USA, WTWW Lebanon TN..... **www.wtww.us**
USA, WWCR Nashville TN..... **www.wwcr.com**
USA, WWRB Manchester TN..... **www.wwrb.org/**
USA, WYFR/Family Radio Worldwide ..... **www.familyradio.com/**
Vatican City State, Vatican Radio..... **www.vaticanradio.org**
Vatican City State, Vatican Radio/Mass..... **www.vaticanradio.org**
Vietnam, Voice of Vietnam..... **www.vov.org.vn**
Yemen, Republic of Yemen Radio/Radio Sana'a **www.yemenradio.net**
Zambia, 1 Africa-CVC Africa..... **www.1africa.tv**
Zambia, Radio Christian Voice/The Voice Africa **www.1africa.tv**

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

September Brings DX

In case you haven't noticed, radio conditions have improved. Two months ago it was all about high levels of summer static, propagation that tested our patience, and fighting pop-up thunderstorms.

Fast forward to September and twilight and nighttime patterns have improved and will continue to do so as longer darkness paths provide an extended time in which to bandscan.

Africa is fading in earlier, improving prior to 0000 UTC, followed closely by South America and Europe. Depending on your location, Indonesia and East Asia are being heard beginning at twilight in the evenings, and any time from 0800-1500 UTC.

Medium wave hobbyists are also noticing improvements. As autumn and winter nears, cross country signals fade in for prime listening earlier in the afternoon and early in the morning.

If reception reports are in your future, many stations offer e-QSLing from either an online reporting form or via an email contact. For those that do not e-QSL, don't forget to enclose return mint postage in your letter. Bill Plum's *DX Stamp Service* offers mint postage and supplies at an affordable price. For a current price list, send email to Bill at *plumdx@msn.com* or to: 12 Glenn Road, Flemington, NJ 08822 USA. Monthly specials are posted on my *Shortwave Central* blog on the first of the month.

The US Postal Service sells International Reply Coupons to enclose within your reception reports. The cost is $2.10 each and they are exchangeable in any Universal Postal Union member country for stamps equal to the minimum postage for an airmail reply to you.

Dust off your receiver from the summer doldrums. September is back and it's time to take advantage of improved radio conditions.

CLANDESTINE

Radio Y'Abaganda, 15410 kHz. E-QSL confirming transmitter site as Issoudun, France from Alex Kalazani Kigongo-Admin Team. Received in three weeks after two followup reports. Original report sent to: *info@ababaka.com,* reply from *ababaka.com@gmail.com* (Artur Fernández Llorella, Spain/playdx). Station targets programming to Uganda. Streaming audio: **www.abaka.com**

Sawtu Linjila (Radio Voice of the Gospel) 9655 kHz via Wertachtal, Germany. Full data e-QSL from Charles Mbayanga with photos of the station in Cameroon. Received in five for email to *mbayangacharles@yahoo.fr* (Alvaro López Osuna, Spain/playdx).

Broadcasts are from the Lutheran World Federation for Fulani listeners in West Africa.

EQUATORIAL GUINEA

Radio Africa, 15190 kHz. Full data photo card of station engineer in studio transmitter room, signed by Jeff Bernald. Pan American Broadcasting cover letter and complete program schedule enclosed. Reply received in eight months from: Pan American Broadcasting, 7011 Koll Center Pkwy, Pleasonton, CA 94566-3253 USA for initial posted email report and follow-up. For reports direct to the station, send reports to: Radio Africa Network, P.O. Box 851, Malabo, Equatorial Guinea. (Edward Kusalik, Daysland, Alberta, Canada).

GERMANY

European Music Radio, 6140 kHz via Wertachtal. E-QSL in 12 days for report to *studio@emr.org.uk* Website with on-demand audio **www.taylor.myby.co.uk** (Llorella).

GUAM

American Forces Network/AFRTS 5765 USB. Full data AFN logo card unsigned. Received in 42 days for an English report to *QSL@media.osd.mil*. Postal address: American Forces Network of Defense. NMC Det AFRTS-DMC, 23755 Z Street, Bldg. 2730, Riverside, CA 92518-2017 USA (Tom Banks, Dallas, TX). Website: **http://myafn.dodmedia.osd.mil/**

MEDIUM WAVE

Benin: TWR-Africa via Parakou 1566 kHz AM. E-QSL from Lorraine Stavropoulos-DX Secretary at *istavrop@twr.sz*. Received in 98 days for email report and mp3 to *1566@twr.org* (Luca Botto Fioras, Italy/playdx). Station address: Trans World Radio-Africa, P.O. Box 4232, Kempton Park, 1620, Republic of South Africa. Website with streaming/on-demand audio **www.twrafrica.org/**

México: XEAI 1470 kHz AM. Full data e-QSL from José Pablo Coello *jcoello@grupoformula.com.mx* in twenty minutes (Maurico Molano, Salamanca, Spain). Station address: Organización Radio Fórmula, Av. Universidad 1273, Col. Del Valle, 3100 México. Website with on-demand audio/podcast **www.radioformula.com.mx**

WBOB 1320 kHz AM *Conservative Talk Radio*. Full data e-QSL from A.J. Davis (Operations Manager *wbobprogramming@yahoo.com*. Received in seven days. (Molano) Streaming audio **www.1320wbob.com**.

WHKT 1650 kHz AM. Two verifications on *Radio Disney* letterhead. Verified for June and October 2007 reception reports (Eric Hopkins, Ayer, MA). Formerly part of the Radio Disney network, WHKT is owned by religious broadcaster Chesapeake-Portsmouth Broadcasting since May 2010. Station is a talk format known as *Freedom 1650*. Reception reports may be sent to: 5041 Corporate Woods Drive # 165, Virginia Beach, VA 23462-4381 USA.

PAPUA NEW GUINEA

Radio Fly, 5960 kHz. No data e-QSL letter from Jobby Paiva, which included station information and notice that QSLs have not been designed. Received in four days for report and seven minute recording and Perseus spectrum screen shot. Station address: P.O. Box 1, Tabubil, Papua New Guinea. Email: *Jobby.Paiva@oktedi.com/jobby.paiva@gmail.com* (Bruce Churchill/Cumbre DX).

PORTUGAL

Deutsche Welle relay via Sines, 6075 kHz. Full data 20th Anniversary card of the fall of the Berlin Wall, unsigned, plus stickers and flag. Received in five days for an email report to *info@dw-world.de* (Osuna) Station address: D-53110 Bonn, Germany. On-demand audio and video at: **www.dw-world.de**

RUSSIA

IBRA Radio via Krasnodar relay, 6185 kHz. Full data verification letter with site notation and cover letter from Maria Levander-IBRA Media. Received in 29 days for an email report to *info@bra.se* (Kusalik).

TAIWAN

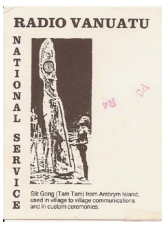
Radio Taiwan International, 9785 kHz. Full data color card of Trichoglottis Philippinensis orchid, part of the *Orchid Kingdom* series. Received in 45 days for an English report and one IRC (Duane Hadley, Bristol, TN). Streaming/on demand audio **http://english.rti.org.tw/**

UTILITY

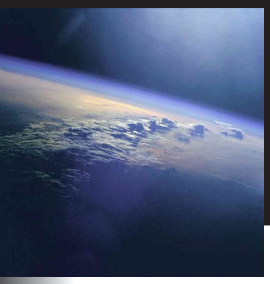
USCG Group Astoria NMW, 2670 kHz (125 watts). Full data prepared form letter verified by illegible signature. Received in 15 days for report, CD and an SASE. CD was returned with letter. QSL address: Commander, USCG Group Astoria, 2185 S.E. 12th Pl., Warrenton, OR 97146-9693 USA (Martin Foltz, CA/UDXF).

VANUATU

Radio Vanuatu, 3945 kHz. Email reply in 14 days after a follow-up to Mr. Warren Robert at *technical@vbtc.com.vu* for a 2006 reception report. Previous postal reports have not been answered. Email response promised a verification card would be sent when available (Jim Evans, Germantown, TN). Station address: PMB 049, Port Vila, Vanuatu.



Additional QSLs, tips and information excluded for space constraints are posted at the *Shortwave Central* blog at **http://mt-shortwave.blogspot.com/**



MTXtra
Shortwave Broadcast Guide

FRENCH

The following language schedule is extracted from our new *MTXtra Shortwave Broadcast Guide* pdf which is a free download to all *MTXpress* subscribers. This new online *Shortwave Broadcast Guide* has more than 9,100 station entries that include all languages being broadcasts via shortwave radio worldwide, sorted by time and updated monthly.

1900 UTC - 3PM EDT / 2PM CDT / 12PM PDT

1900	1905		Canada, Radio Canada International			9515na
1900	1905	DRM	Canada, Radio Canada International			9800na
1900	1927		Iran, VOIRI/IRIB	5945va	9860va	13600va 15085va
1900	1930	mtwhfa	Albania, Radio Tirana		7465eu	
1900	1930		USA, WYFR/Family Radio Worldwide			17585af
1900	1945		USA, WYFR/Family Radio Worldwide			21455va
1900	2000		Canada, Radio Canada International			11765af 13730af 15320af 17735af
1900	2000		China, China Radio International			5970eu 6055af 7350af 9480eu 9645af 11695eu
1900	2000		Congo Dem. Republic, Radio Kazuhi			6210do
1900	2000		Congo Republic, Radio Congo			6115do
1900	2000		France, Radio France Internationale			9790af 11705af 13695af 21690af
1900	2000		Gabon, Africa No. 1		9580af	
1900	2000		Guinea, Radio Familia		4900do	
1900	2000		Guinea, RTV Guineenne/Radio Conakry			7125do
1900	2000		Mali, ORTM Du Mali		5995do	
1900	2000		Niger, ORTN/La Voix du Sahel	9705do		
1900	2000		Russia, Voice of Russia		11550af	12030af 12050af 15465af
1900	2000	DRM	Russia, Voice of Russia		9880af	
1900	2000		Rwanda, Radio Rwanda		6055do	
1900	2000		South Korea, KBS World Radio			6145eu
1900	2000	Sat	Spain, Radio Exterior de Espana			9570af
1900	2000	Sun	Spain, Radio Exterior de Espana			12015me
1900	2000		Syria, Radio Damascus		9330va	12085va
1900	2000		Taiwan, Radio Taiwan International			6045af 15690af
1900	2000		USA, Voice of America		6080af	6170af 9815af 17550af
1900	2000		USA, WYFR/Family Radio Worldwide			11840af 21525af
1930	1945	Sat	UK, Bible Voice Broadcasting		11830af	
1930	1950		Vatican City State, Vatican Radio			4005eu 5885eu 7250eu 9645eu
1930	2000		Austria, AWR Europe			15220af
1930	2000	f	Germany, Radio Santec		9880va	11550va 12030va 15465va
1930	2000		Slovakia, Radio Slovakia International			5920eu 6055eu
1930	2000		Turkey, Voice of Turkey		9535af	9635eu
1930	2000		Vietnam, Voice of Vietnam/Overseas Service			7280eu 9730eu
1935	1950		Swaziland, TWR Swaziland		9625af	
1945	2000		India, All India Radio		6180af	7410af 13605af
1950	2000	Sat	Swaziland, TWR Swaziland		9625af	

2000 UTC - 4PM EDT / 3PM CDT / 1PM PDT

2000	2010		Congo Dem. Republic, Radio Kazuhi			6210do
2000	2020	Sat	Swaziland, TWR Swaziland		9625af	
2000	2026		Romania, Radio Romania International			6065eu
2000	2030		Cuba, Radio Havana Cuba		11760sa	
2000	2030		Germany, AWR Europe		9765af	11755af
2000	2030		India, All India Radio		6180af	7550af 13605af
2000	2030		Turkey, Voice of Turkey		9535af	9635eu
2000	2030	w	UK, Bible Voice Broadcasting		9485af	
2000	2030		USA, Voice of America		6080af	6170af 9815af 15730af 17550af
2000	2056	DRM	Romania, Radio Romania International			7295eu
2000	2057		North Korea, Voice of Korea		13760eu	15245eu
2000	2100	mtwhf	Argentina, Radio Nacional RAE			15345eu
2000	2100		Bulgaria, Radio Bulgaria		5900eu	7400eu
2000	2100		Congo Republic, Radio Congo			6115do
2000	2100		Egypt, Radio Cairo		6270eu	
2000	2100		France, Radio France Internationale			7205af 9790af 21690af
2000	2100		Gabon, Africa No. 1		9580af	
2000	2100		Guinea, Radio Familia		4900do	
2000	2100		Guinea, RTV Guineenne/Radio Conakry			7125do
2000	2100		Indonesia, Voice of Indonesia		9526va	
2000	2100		Mali, ORTM Du Mali		5995do	
2000	2100		Niger, ORTN/La Voix du Sahel	9705do		
2000	2100		Nigeria, Voice of Nigeria/External Service			7255af
2000	2100		Russia, Voice of Russia		12040af	
2000	2100	DRM	Russia, Voice of Russia		9880af	
2000	2100	mtwhf	Spain, Radio Exterior de Espana			9690me 11620af
2000	2100		USA, WYFR/Family Radio Worldwide			7540eu 9595af
2005	2100		Canada, Radio Canada International			9515na
2030	2100		Austria, AWR Europe		11955af	
2030	2100		China, China Radio International			7320eu 9430eu
2030	2100		Egypt, Radio Cairo		9280af	
2030	2100		Serbia, International Radio of Serbia			6100eu
2030	2100	Sat/Sun	USA, Voice of America		9815af	9830af 12080af 15185af 15730af
2030	2100		Vatican City State, Vatican Radio			7365af 9755af 11625af

2100 UTC - 5PM EDT / 4PM CDT / 2PM PDT

2100	2105		Canada, Radio Canada International			9515na
2100	2115		Egypt, Radio Cairo		6170eu	
2100	2130		China, China Radio International			7320eu
2100	2130	mtwhf	USA, Voice of America		9815af	9830af 12035af 12080af
2100	2130		Vietnam, Voice of Vietnam/Overseas Service			7220me 7280eu 9730eu 9550me
2100	2200		Canada, Radio Canada International			9525na 15235na 15330na 17735na
2100	2200		Congo Republic, Radio Congo			6115do
2100	2200		Cuba, Radio Havana Cuba		11760sa	
2100	2200		France, Radio France Internationale			7205af 21690af
2100	2200		Gabon, Africa No. 1		9580af	
2100	2200		Guinea, Radio Familia		4900do	
2100	2200		Guinea, RTV Guineenne/Radio Conakry			7125do
2100	2200		Mali, ORTM Du Mali		5995do	
2100	2200	Sun	Niger, ORTN/La Voix du Sahel	9705do		
2100	2200		USA, WYFR/Family Radio Worldwide			7290af 17725sa

2200 UTC - 6PM EDT / 5PM CDT / 3PM PDT

2200	2227		Czech Republic, Radio Prague			9440na
2200	2230		China, China Radio International			9430eu 11660eu
2200	2230		Egypt, Radio Cairo		9280af	
2200	2245		USA, WYFR/Family Radio Worldwide			15600eu
2200	2300		Congo Republic, Radio Congo			6115do
2200	2300		Gabon, Africa No. 1		9580af	
2200	2300		Guinea, Radio Familia		4900do	
2200	2300		Guinea, RTV Guineenne/Radio Conakry			7125do
2200	2300		Mali, ORTM Du Mali		5995do	
2200	2300		Niger, ORTN/La Voix du Sahel	9705do		

2300 UTC - 7PM EDT / 6PM CDT / 4PM PDT

2300	0000		Guinea, Radio Familia		4900do	
2300	0000		Guinea, RTV Guineenne/Radio Conakry			7125do
2300	0000		Mali, ORTM Du Mali		5995do	
2300	0000	Sat/Sun	Spain, Radio Exterior de Espana			6155eu
2300	0000		Spain, Radio Exterior de Espana			6055na
2300	0000		USA, WYFR/Family Radio Worldwide			6985na
2300	2300		Canada, Radio Canada International			9525na
2300	2315		Gabon, Africa No. 1		9580af	
2300	2315	tf	Germany, Radio Reveil Paroles de Vie			9580af

Mixed (English Plus Other Languages) Shortwave Broadcast Guide

0000 UTC - 8PM EDT / 7PM CDT / 5PM PDT

0000	0100		Solomon Islands, SIBC	5020do	
0000	0100		USA, WHRI Cypress Creek SC		5850eu
0000	0100		USA, WHRI Cypress Creek SC		7315ca
0000	0100		Vanuatu, Radio Vanuatu	7260do	
0000	0100		Zimbabwe, Voice of Zimbabwe		4828af
0000	0100		Zimbabwe, ZBC/Radio Zimbabwe		3396do

0100 UTC - 9PM EDT / 8PM CDT / 6PM PDT

0100	0200		Solomon Islands, SIBC	5020do	
0100	0200		USA, WHRI Cypress Creek SC		5850eu
0100	0200		USA, WHRI Cypress Creek SC		7315ca
0100	0200		Vanuatu, Radio Vanuatu	7260do	
0100	0200		Zimbabwe, Voice of Zimbabwe		4828af
0100	0200		Zimbabwe, ZBC/Radio Zimbabwe		3396do

0200 UTC - 10PM EDT / 9PM CDT / 7PM PDT

0200	0300		Solomon Islands, SIBC	5020do	
0200	0300		USA, WHRI Cypress Creek SC		5850eu
0200	0300		USA, WHRI Cypress Creek SC		7315ca
0200	0300		Vanuatu, Radio Vanuatu	7260do	
0200	0300		Zimbabwe, Voice of Zimbabwe		4828af
0200	0300		Zimbabwe, ZBC/Radio Zimbabwe		3396do

0300 UTC - 11PM EDT / 10PM CDT / 8PM PDT

0300	0400		Solomon Islands, SIBC	5020do	
0300	0400		USA, WHRI Cypress Creek SC		5850eu
0300	0400		USA, WHRI Cypress Creek SC		7315ca
0300	0400		Vanuatu, Radio Vanuatu	7260do	
0300	0400		Zimbabwe, Voice of Zimbabwe		4828af
0300	0400		Zimbabwe, ZBC/Radio Zimbabwe		3396do
0358	0400		Clandestine, Radio Voice of the People		9895af

0400 UTC - 12AM EDT / 11PM CDT / 9PM PDT

0400	0430		Zimbabwe, Voice of Zimbabwe		4828af
0400	0500		Clandestine, Radio Voice of the People		9875af
0400	0500		Solomon Islands, SIBC	5020do	
0400	0500	mtwhfs	USA, WHRI Cypress Creek SC		5850eu
0400	0500		USA, WHRI Cypress Creek SC		7315ca
0400	0500		Vanuatu, Radio Vanuatu	7260do	
0400	0500		Zimbabwe, ZBC/Radio Zimbabwe		3396do
0430	0500		Nigeria, FRCN Kaduna/Channel 2		4770do
0430	0500		Zimbabwe, Voice of Zimbabwe		5975af

0500 UTC - 1AM EDT / 12AM CDT / 10PM PDT

0500	0530		Zimbabwe, ZBC/Radio Zimbabwe		3396do
0500	0600		Nigeria, FRCN Kaduna/Channel 2		4770do
0500	0600		Solomon Islands, SIBC	5020do	
0500	0600	mtwhfa	USA, WHRI Cypress Creek SC		7315ca
0500	0600		Vanuatu, Radio Vanuatu	7260do	
0500	0600		Zimbabwe, Voice of Zimbabwe		5975af
0530	0600		Liberia, Radio ELWA	6070do	
0530	0600		Zimbabwe, ZBC/Radio Zimbabwe		6045do

0600 UTC - 2AM EDT / 1AM CDT / 11PM PDT

0600	0700		Greece, Voice of Greece	9420eu	15630eu
0600	0700		Liberia, Radio ELWA	6070do	
0600	0700		Nigeria, FRCN Kaduna/Channel 2		4770do
0600	0700		Solomon Islands, SIBC	5020do	
0600	0700		USA, WHRI Cypress Creek SC		7315ca
0600	0700		Vanuatu, Radio Vanuatu	7260do	
0600	0700		Zimbabwe, Voice of Zimbabwe		5975af
0600	0700		Zimbabwe, ZBC/Radio Zimbabwe		6045do
0608	0615	mtwhf	Austria, Radio O1 International		6155va

0700 UTC - 3AM EDT / 2AM CDT / 12AM PDT

0700	0800		Greece, Voice of Greece	9420eu	15630eu
0700	0800		Liberia, Radio ELWA	6070do	
0700	0800		Nigeria, FRCN Kaduna/Channel 2		4770do
0700	0800		Solomon Islands, SIBC	5020do	
0700	0800	mtwhfa	USA, WHRI Cypress Creek SC		7315ca
0700	0800		Vanuatu, Radio Vanuatu	3945do	5055do
0700	0800		Zimbabwe, Voice of Zimbabwe		5975af
0700	0800		Zimbabwe, ZBC/Radio Zimbabwe		6045do

0800 UTC - 4AM EDT / 3AM CDT / 1AM PDT

0800	0900		Greece, Voice of Greece	9420eu	15630eu
0800	0900		Nigeria, FRCN Kaduna/Channel 2		4770do
0800	0900		Solomon Islands, SIBC	5020do	
0800	0900	mtwhfa	USA, WHRI Cypress Creek SC		7315ca
0800	0900		Vanuatu, Radio Vanuatu	3945do	5055do
0800	0900		Zimbabwe, Voice of Zimbabwe		5975af
0800	0900		Zimbabwe, ZBC/Radio Zimbabwe		6045do

0900 UTC - 5AM EDT / 4AM CDT / 2AM PDT

0900	1000		Greece, Voice of Greece	9420eu	15630eu
0900	1000		Nigeria, FRCN Kaduna/Channel 2		4770do
0900	1000		Solomon Islands, SIBC	5020do	
0900	1000	mtwhfa	USA, WHRI Cypress Creek SC		7315ca
0900	1000		Vanuatu, Radio Vanuatu	3945do	5055do
0900	1000		Zimbabwe, Voice of Zimbabwe		5975af
0900	1000		Zimbabwe, ZBC/Radio Zimbabwe		6045do

1000 UTC - 6AM EDT / 5AM CDT / 3AM PDT

1000	1100		Nigeria, FRCN Kaduna/Channel 2		4770do
1000	1100		Solomon Islands, SIBC	5020do	
1000	1100	mtwhfa	USA, WHRI Cypress Creek SC		7315ca
1000	1100		Vanuatu, Radio Vanuatu	3945do	5055do
1000	1100		Zimbabwe, Voice of Zimbabwe		5975af
1000	1100		Zimbabwe, ZBC/Radio Zimbabwe		6045do

1100 UTC - 7AM EDT / 6AM CDT / 4AM PDT

1100	1130		Solomon Islands, SIBC	5020do	
1100	1200		Nigeria, FRCN Kaduna/Channel 2		4770do
1100	1200		USA, WHRI Cypress Creek SC		7315ca
1100	1200		Vanuatu, Radio Vanuatu	3945do	5055do
1100	1200		Zimbabwe, Voice of Zimbabwe		5975af
1100	1200		Zimbabwe, ZBC/Radio Zimbabwe		6045do

1200 UTC - 8AM EDT / 7AM CDT / 5AM PDT

1200	1300		Nigeria, FRCN Kaduna/Channel 2		4770do
1200	1300		USA, WHRI Cypress Creek SC		5920am
1200	1300		Vanuatu, Radio Vanuatu	3945do	5055do
1200	1300		Zimbabwe, Voice of Zimbabwe		5975af
1200	1300		Zimbabwe, ZBC/Radio Zimbabwe		6045do

1300 UTC - 9AM EDT / 8AM CDT / 6AM PDT

1300	1400		Greece, Voice of Greece	9420eu	15630eu
1300	1400		Nigeria, FRCN Kaduna/Channel 2		4770do
1300	1400		USA, WHRI Cypress Creek SC	11785na	
1300	1400		USA, WHRI Cypress Creek SC		7315ca
1300	1400		Vanuatu, Radio Vanuatu	3945do	5055do
1300	1400		Zimbabwe, Voice of Zimbabwe		5975af
1300	1400		Zimbabwe, ZBC/Radio Zimbabwe		6045do

1400 UTC - 10AM EDT / 9AM CDT / 7AM PDT

1400	1500		Nigeria, FRCN Kaduna/Channel 2		4770do
1400	1500		USA, WHRI Cypress Creek SC	11785na	
1400	1500		USA, WHRI Cypress Creek SC		7315ca
1400	1500	mtwhfa	USA, WHRI Cypress Creek SC		15665ca
1400	1500		Vanuatu, Radio Vanuatu	3945do	5055do
1400	1500		Zimbabwe, Voice of Zimbabwe		5975af
1400	1500		Zimbabwe, ZBC/Radio Zimbabwe		6045do

1500 UTC - 11AM EDT / 10AM CDT / 8AM PDT

1500	1530		Zimbabwe, Voice of Zimbabwe		5975af
1500	1600		Nigeria, FRCN Kaduna/Channel 2		4770do
1500	1600		USA, WHRI Cypress Creek SC	11785na	
1500	1600	Sun	USA, WHRI Cypress Creek SC		13650eu
1500	1600		USA, WHRI Cypress Creek SC		9495ca
1500	1600	mtwhfa	USA, WHRI Cypress Creek SC		15665ca
1500	1600		Vanuatu, Radio Vanuatu	3945do	5055do
1500	1600		Zimbabwe, ZBC/Radio Zimbabwe		6045do
1500	1700		USA, WHRI Cypress Creek SC	11785na	
1530	1600		Zimbabwe, Voice of Zimbabwe		4828af

1600 UTC - 12PM EDT / 11AM CDT / 9AM PDT

1600	1630		Zimbabwe, ZBC/Radio Zimbabwe		6045do
1600	1700		Nigeria, FRCN Kaduna/Channel 2		4770do
1600	1700		USA, WHRI Cypress Creek SC		9495ca
1600	1700		Vanuatu, Radio Vanuatu	3945do	5055do
1600	1700		Zimbabwe, Voice of Zimbabwe		4828af
1630	1700		Zimbabwe, ZBC/Radio Zimbabwe		3396do

1700 UTC - 1PM EDT / 12PM CDT / 10AM PDT

1700	1800		Clandestine, SW Radio Africa	4880af	
1700	1800		Nigeria, FRCN Kaduna/Channel 2		4770do
1700	1800		USA, WHRI Cypress Creek SC	11785na	
1700	1800	mtwhfa	USA, WHRI Cypress Creek SC		15665ca
1700	1800		USA, WHRI Cypress Creek SC		9495ca
1700	1800		Vanuatu, Radio Vanuatu	3945do	5055do
1700	1800		Zimbabwe, Voice of Zimbabwe		4828af
1700	1800		Zimbabwe, ZBC/Radio Zimbabwe		3396do
1730	1800		Liberia, Radio ELWA	6070do	
1755	1800		Clandestine, Zimbabwe Community Radio 4895af		

1800 UTC - 2PM EDT / 1PM CDT / 11AM PDT

1800	1830	f	USA, Voice of America/Studio 7 11605af 15775af		4930af
1800	1855		Clandestine, Zimbabwe Community Radio 4895af		
1800	1900		Clandestine, SW Radio Africa	4880af	
1800	1900		Liberia, Radio ELWA	6070do	
1800	1900		Nigeria, FRCN Kaduna/Channel 2		4770do
1800	1900		USA, WHRI Cypress Creek SC	11785na	
1800	1900		USA, WHRI Cypress Creek SC		9495ca
1800	1900	mtwhfa	USA, WHRI Cypress Creek SC		15665ca
1800	1900		Vanuatu, Radio Vanuatu	3945do	5055do
1800	1900		Zimbabwe, Voice of Zimbabwe		4828af
1800	1900		Zimbabwe, ZBC/Radio Zimbabwe		3396do
1815	1830	Sat	Clandestine, Baati Rewmi-VO the Nation/Save the Gambia 15225af		
1830	1900	th	USA, Voice of America/Studio 7 15775af		11605af

1900 UTC - 3PM EDT / 2PM CDT / 12PM PDT

1900	2000		Liberia, Radio ELWA	6070do	
1900	2000		Nigeria, FRCN Kaduna/Channel 2		4770do
1900	2000		Solomon Islands, SIBC	5020do	
1900	2000		USA, WHRI Cypress Creek SC	11785na	
1900	2000		USA, WHRI Cypress Creek SC		9495ca
1900	2000		Vanuatu, Radio Vanuatu	3945do	5055do
1900	2000		Zimbabwe, Voice of Zimbabwe		4828af
1900	2000		Zimbabwe, Voice of Zimbabwe		4828af
1900	2000		Zimbabwe, ZBC/Radio Zimbabwe		3396do

2000 UTC - 4PM EDT / 3PM CDT / 1PM PDT

2000	2100		Liberia, Radio ELWA	6070do	
2000	2100		Nigeria, FRCN Kaduna/Channel 2		4770do
2000	2100		Solomon Islands, SIBC	5020do	
2000	2100		USA, WHRI Cypress Creek SC	11785na	
2000	2100		USA, WHRI Cypress Creek SC		9495ca
2000	2100	mtws	USA, WHRI Cypress Creek SC		15665sa
2000	2100		Vanuatu, Radio Vanuatu	7260do	
2000	2100		Zimbabwe, Voice of Zimbabwe		4828af
2000	2100		Zimbabwe, ZBC/Radio Zimbabwe		3396do

2100 UTC - 5PM EDT / 4PM CDT / 2PM PDT

2100	2200		Liberia, Radio ELWA	6070do	
2100	2200		Nigeria, FRCN Kaduna/Channel 2		4770do
2100	2200		Solomon Islands, SIBC	5020do	
2100	2200		USA, WHRI Cypress Creek SC	11785na	
2100	2200		USA, WHRI Cypress Creek SC		5850eu
2100	2200		USA, WHRI Cypress Creek SC		9495ca
2100	2200	mtws	USA, WHRI Cypress Creek SC		15665sa
2100	2200		Vanuatu, Radio Vanuatu	7260do	
2100	2200		Zimbabwe, Voice of Zimbabwe		4828af
2100	2200		Zimbabwe, ZBC/Radio Zimbabwe		3396do

2200 UTC - 6PM EDT / 5PM CDT / 3PM PDT

2200	2230	Sat/Sun	Liberia, Radio ELWA	6070do	
2200	2300		Liberia, Radio ELWA	6070do	
2200	2300		Nigeria, FRCN Kaduna/Channel 2		4770do
2200	2300		Solomon Islands, SIBC	5020do	
2200	2300		USA, WHRI Cypress Creek SC	11785na	
2200	2300		USA, WHRI Cypress Creek SC		7335ca
2200	2300		Vanuatu, Radio Vanuatu	7260do	
2200	2300		Zimbabwe, Voice of Zimbabwe		4828af
2200	2300		Zimbabwe, ZBC/Radio Zimbabwe		3396do

2300 UTC - 7PM EDT / 6PM CDT / 4PM PDT

2300	0000		Solomon Islands, SIBC	5020do	
2300	0000		USA, WHRI Cypress Creek SC		5850eu
2300	0000		USA, WHRI Cypress Creek SC		7315ca
2300	0000		Zimbabwe, Voice of Zimbabwe		4828af
2300	0000		Zimbabwe, ZBC/Radio Zimbabwe		3396do
2300	2305		Nigeria, FRCN Kaduna/Channel 2		4770do

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Frequency Coverage: 25.0000-54.0000 MHz., 108.0000-174.,.0000 MHz., 400.0000-512.000. MHz., 806.0000-823.9950 MHz., 849.0125-868.9950 MHz., 894.0125-956.0000 MHz.

The Bearcat BCT8 scanner, licensed by NASCAR, is a superb preprogrammed 800 MHz trunked highway patrol system scanner. Featuring TrunkTracker III, PC Programming, 250 Channels with unique BearTracker warning system to alert you to activity on highway patrol link frequencies. Preprogrammed service searches makes finding interesting active frequencies even easier and include preprogrammed police, fire and emergency medical, news agency, weather, CB band, air band, railroad, marine band and department of transportation service searches. The BCT8 also has preprogrammed highway patrol alert frequencies by state to help you quickly find frequencies likely to be active when you are driving. The BCT8 includes AC adapter, DC power cable, cigarette lighter adapter plug, telescopic antenna, window mount antenna, owner's manual, one year limited Uniden warranty, frequency guide and free mobile mounting bracket. For maximum scanning enjoyment, also order the following optional accessories: External speaker **ESP20** with mounting bracket & 10 feet of cable with plug attached $19.95. Magnetic Mount mobile antenna **ANTMMBNC** for $29.95.

Bearcat® BCD396T Trunk Tracker IV

Suggested list price $799.95/**CEI price $519.95**

APCO 25 9,600 baud compact digital ready handheld TrunkTracker IV scanner featuring Fire Tone Out Paging, Close Call and Dynamically Allocated Channel Memory (up to 6,000 channels), SAME Weather Alert, CTCSS/DCS, Alpha Tagging. Size: 2.40" Wide x 1.22" Deep x 5.35" High

Frequency Coverage:
25.0000-512.0000 MHz., 764.0000-775.9875 MHz., 794.0000-823.9875 MHz., 849.0125-868.8765 MHz., 894.0125-956.000 MHz., 1240.0000 MHz.-1300.0000 MHz.

The handheld BCD396T scanner was designed for National Security/Emergency Preparedness (NS/EP) and homeland security use with new features such as **Fire Tone Out Decoder**. This feature lets you set the BCD396T to alert if your selected two-tone sequential paging tones are received. Ideal for on-call firefighters, emergency response staff and for activating individual scanners used for incident management and population attack warning. **Close Call Radio Frequency Capture** – Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. Useful for intelligence agencies for use at events where you don't have advance notice or knowledge of the radio communications systems and assets you need to intercept. The BCD396T scanner is designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS, LTR and EDACS® analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. **Dynamically Allocated Channel Memory** - The BCD396T scanner's memory is organized so that it more closely matches how radio systems actually work. Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 3,000 channels are typical but **over 6,000 channels are possible** depending on the scanner features used. You can also easily determine how much memory you have used and how much memory you have left. **Preprogrammed Systems** - The BCD396T is preprogrammed with over 400 channels covering police, fire and ambulance operations in the 25 most populated counties in the United States, plus the most popular digital systems. **3 AA NiMH or Alkaline battery operation and Charger** – 3 AA battery operation - The BCD396T includes 3 premium 2,300 mAH Nickel Metal Hydride AA batteries to give you the most economical power option available. You may also operate the BCD396D using 3 AA alkaline batteries. Unique Data Skip - Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. Memory Backup - If the battery completely discharges or if power is disconnected, the frequencies programmed in the BCD396T scanner are retained in memory. Manual Channel Access - Go directly to any channel. LCD Back Light - A blue LCD light remains on when the back light key is pressed. Autolight - Automatically turns the blue LCD backlight on when your scanner stops on a transmission. Battery Save - In manual mode, the BCD396T automatically reduces its power requirements to extend the battery's charge. Attenuator - Reduces the signal strength to help prevent signal overload. The BCD396T also works as a conventional scanner to continuously monitor many radio conversations even though the message is switching frequencies. The BCD396T comes with AC adapter, 3 AA nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, SMA/BNC adapter, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO or ESAS systems. Order on-line at www.usascan.com or call 1-800-USA-SCAN.

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Scancat Gold For Windows Software	$99.95
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Bearcat® BC246T Trunk Tracker III

Suggested list price $399.95/**CEI price $214.95**

Compact professional handheld TrunkTracker III scanner featuring Close Call and Dynamically Allocated Channel Memory (up to 2,500 channels), SAME Weather Alert, CTCSS/DCS, Alpha Tagging. Size: 2.72" Wide x 1.26" Deep x 4.6" High

Frequency Coverage:
25.0000-54.0000 MHz., 108.0000-174.0000 MHz., 216.0000-224.9800 MHz., 400.0000-512.0000 MHz., 806.0000-823.9875 MHz., 849.0125-868.9875 MHz., 894.0125-956.000 MHz., 1240.0000 MHz.-1300.0000 MHz.

The handheld BC246T TrunkTracker scanner has so many features, we recommend you visit our web site at www.usascan.com and download the free owner's manual. Popular features include **Close Call Radio Frequency Capture** – Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. **Dynamically Allocated Channel Memory** - Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 1,600 channels are typical but **over 2,500 channels are possible** depending on the scanner features used. You can also easily determine how much memory is used. **Preprogrammed Service Search (10)** - Makes it easy to find interesting frequencies used by public safety, news media TV broadcast audio, Amateur (ham) radio, CB radio, Family Radio Service, special low power, railroad, aircraft, marine, racing and weather frequencies. **Quick Keys** - allow you to select systems and groups by pressing a single key. **Text Tagging** - Name each system, group, channel, talk group ID, custom search range, and S.A.M.E. group using 16 characters per name. **Memory Backup** - When power is lost or disconnected, your BC246T retains the frequencies that were programmed in memory. **Unique Data Skip** - Allows the BC246T to skip over unwanted data transmissions and birdies. **Attenuator** - You can set the BC246T attenuator to reduce the input strength of strong signals by about 18 dB. **Duplicate Frequency Alert** - Alerts you if you try to enter a duplicate name or frequency already stored in the scanner. **22 Bands** - with aircraft and 800 MHz. The BC246T comes with AC adapter, 2 AA 1,800 mAH nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. For more fun, order our optional deluxe racing headset part **#HF24RS** for $29.95. Order now at www.usascan.com or call 1-800-USA-SCAN.

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Larry Van Horn, N5FPW
larryvanhorn@monitoringtimes.com
http://mt-milcom.blogspot.com

Monitoring Military VHF Low Band Communications

Sunspot numbers are finally on the increase as we leave the solar minimum portion of the sunspot cycle behind. As the solar flux/sunspot numbers increase, the frequencies that can support long range communications will also rise. For the military monitor, this can open a whole new world of monitoring opportunities in the lower frequency ranges of the VHF spectrum.

Most scanner enthusiasts are familiar with the late spring and summer propagation phenomenon of sporadic E-skip that supports continent-wide communications in the 30-50 MHz range, and sometimes even higher in frequency. But another propagation mode will kick in soon as the maximum usable frequency (MUF) continues to rise – F2 skip.

Unlike the previously mentioned sporadic E-skip, which is short term and geographically sporadic in nature, F2 skip is more predictable, long term and widespread in coverage. This then opens up the various US government and Department of Defense (DoD) land mobile radio (LMR) bands in the VHF low band spectrum (30-88 MHz) for monitoring. These government/military LMR bands are sprinkled throughout the VHF low band spectrum, with some specifically assigned subbands located in the following ranges: 30.00-30.55, 32-33, 34-35, 36-37, 38-39, 40-42, 46.6-47, 49.61-49.99 MHz.

❖ A Military VHF Monitoring Game Plan

Full band searching of the 30-88 MHz spectrum is impractical. This range of frequencies is much too large a band to scan in its entirety with any sort of effectiveness. While the radios that the military uses can technically use any frequency in this range, you are fairly safe in skipping over civilian allocations. The vast majority of military traffic is in the federal segments I mentioned above.

When I first started using a programmable scanner to monitor this frequency range, I was limited to only one search range at a time. I usually had the lowest range – 30-30.55 MHz – programmed in my search limits as I watched for openings to occur. As the MUF would rise, I would reprogram my scanner to search the higher frequencies looking for activity.

One of the advantages of using the newer generation of dynamic allocation scanners manufactured by Uniden is their multiple search range capability. I can program up to ten search ranges at a time in these modern marvels, in which I can select one, several, or all the programmed ranges to search at a time.

However, I offer the following caveat: While most military communications occur within the subbands I have outlined above, those subbands do not support all the military activity available in the 30-88 MHz frequency ranges. Table 1 is a detailed breakdown of this spectrum from National Telecommunication and Information Agency (NTIA) official records of the activity assigned in the VHF low band spectrum.

There are also military communications outside the U.S. from foreign countries and US forces stationed overseas that do not support the subbands mentioned above. So, general scans of the entire spectrum from at least 30-50 MHz are warranted if you have F2 propagation conditions and you want to monitor all the military communications within that portion of the radio spectrum.

In a future *Milcom* column, I will provide a list of current and verified activity that has been monitored in the 30-88 MHz range. In the meantime, as we move into the Fall F2 DX season and the sunspot count continues to rise, plug in the frequency ranges from our table of allocations and let us know what you are hearing in the government VHF low bands.

Until next time, 73 and good hunting.

TABLE 1: NTIA TABLE OF ALLOCATIONS, 30-88 MHZ

Note: Descriptions following bolded titles in this table refer only to US government assignments within each subband.

30.000-30.560 Government Fixed/Mobile
Military LMR: Used by the military services for tactical and training operations to include tactical air-ground and air-air communications
Non-Military LMR: Other Federal agencies use this band for natural resource management and for wildlife telemetry.

30.560-32.000 Fixed/Land Mobile: Private Land Mobile (Part 90)
Military LMR: Used by the military services for tactical and training operations on a non-interference basis.
Non-Military LMR: Other Federal agencies use this band for natural resource management and for forest fire fighting.

32.000-33.000 Government Fixed/Mobile
Military LMR: This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.
Non-Military LMR: Other uses include land management and protection of natural resources.

33.000-34.000 Fixed/Land Mobile: Private Land Mobile (Part 90)
Non-Military LMR: Federal agencies are authorized to use this band as part of mutual aid response with local communities (fire, medical, etc.).
Military LMR: Used by the military services for tactical and training operations on a non-interference basis.

34.000-35.000 Government Fixed/Mobile
Military LMR: This band is used primarily for tactical and training operations by the U.S. military for net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.
Non-Military LMR: Extensive use of frequencies in this band is for natural resource management, park security law enforcement at national parks, forests, wildlife refuge areas, etc. Some other uses of this are for law enforcement and facilities security management.

35.000-36.000 Fixed/Land Mobile: Public Mobile (Part 22)/Private Land Mobile (Part 90)
Military LMR: Used by the military services for tactical and training operations on a non-interference basis and for experimental testing.

36.000-37.000 Government Fixed/Mobile
Military LMR: This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.
Non-Military LMR: Other uses include national park management, law enforcement, pubic safety nets, contingencies, and natural resources management.

37.000-37.500 Land Mobile: Private Land Mobile (Part 90)
Non-Military LMR: Some Federal agencies are authorized to use this band for mutual aid response to local communities.
Military LMR: Military services have some usage for tactical and training operations on a non-interference basis.

37.500-38.000 Radio Astronomy, Land Mobile: Private Land Mobile (Part 90)

Radio Astronomy: Continuum observations are performed in this band that study electromagnetic radiation from the planet Jupiter and from the Sun.

38.000-38.250 Government Fixed/Mobile, Radio Astronomy

Military LMR: This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements, other tactical air-ground and air-air communications, and experimental testing.

Maritime Mobile: U.S. Coast Guard ship-to-ship and ship-to-shore communications.

Radio Astronomy: Continuum observations are performed in this band to study electromagnetic radiation from the Sun and the planet Jupiter.

38.250-39.000 Government Fixed/Mobile

Non-Military LMR: This band is extensively used for land mobile radio communications in the operation, protection, and maintenance of national parks, forests, wildlife refuge areas, etc. Frequencies in this band are also used for reservation programs, law enforcement, public safety operations, control of power generation transmission and water facilities, environmental data collection, fish management, and wildlife telemetry programs.

Military LMR: This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.

39.000-40.000 Land Mobile: Private Land Mobile (Part 90)

Non-Military LMR: Some Federal usage is authorized in this band for mutual aid response to local communities (fire, medical, oil spills, etc.).

40.000-40.660 Government Fixed/Mobile

Non-Military LMR: This band is extensively used for land mobile radio communications in the operation, protection, and maintenance of national parks, forests, wildlife refuge areas, etc. Frequencies in this band are also used for meteor-burst communications, reservation programs, public safety operations, environmental data collection, fish management, and wildlife telemetry programs.

Military LMR: This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.

40.660-40.700 Government Fixed/Mobile

Non-Military LMR: This band is extensively used for land mobile radio communications in the operation, protection, and maintenance of national parks, forests, wildlife refuge areas, etc. Frequencies in this band are also used for fire suppression, reservation programs, environmental data collection, fish management, and wildlife telemetry programs.

Military LMR: This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.

ISM: The band 40.66-40.70 MHz (center frequency 40.68 MHz) is designated for industrial, scientific and medical (ISM) applications.

40.700-42.000 Government Fixed/Mobile

Non-Military LMR: This band is extensively used for land mobile radio communications in the operation, protection, and maintenance of national parks, forests, wildlife refuge areas, etc. Frequencies in this band are also used for meteor-burst communications, reservation programs, law enforcement, public safety operations, control of power generation transmission and water facilities, environmental data collection, fish management, and wildlife telemetry programs.

Military LMR: This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.

42.000-43.690 Fixed/Land Mobile: Public Mobile (Part 22)/Private Land Mobile (Part 90)

Non-Military LMR: Primarily used by Federal agencies for mutual aid response with local communities.

Military LMR: Used by the military services for tactical and training operations on a non-interference basis.

43.690-46.600 Land Mobile: Private Land Mobile (Part 90)

Non-Military LMR: Primarily used by Federal agencies for mutual aid response with local communities.

Military LMR: Used by the military services for tactical and training operations on a non-interference basis.

46.600-47.000 Government Fixed/Mobile

Non-Military LMR: Extensive use of this band is for contingency response to various national disasters. Others uses are for national resources management, law enforcement, tornado tracking, and various meteorological research support.

Military LMR: This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.

47.000-49.600 Land Mobile: Private Land Mobile (Part 90)

Experimental: Used for experimental research to observe and measure currents in harbor areas in support of vessel safety.

Military LMR: Used by the military services for tactical and training operations on a non-interference basis.

49.600-50.000 Government Fixed/Mobile

Non-Military LMR: This band is used extensively to support contingencies or natural ecological emergencies, some public safety requirements, MARS system, and air-quality measurements.

Experimental: Research is performed in various regions of the atmosphere as well as experimental development of portable space orbital debris ground radars.

Military LMR: This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.

50.000-54.000 Amateur Radio (6 meter band)

Military LMR: Military units conduct tactical and training operations in this band on a non-interference basis.

54.000-72.000 Broadcasting: Broadcast Radio (TV) (Part 73), LPTV, TV Translator/Booster (Part 74G), Low Power Auxiliary (Part 74H)

Experiment: On a non-interference basis, used primarily for experimental testing and equipment checkout.

Broadcasting: Some TV broadcast is performed in various Pacific island areas.

72.000-73.000 Fixed/Mobile: Public Mobile (Part 22), Aviation (Part 87), Private Land Mobile (Part 90), Personal Radio (Part 95)

Radio Astronomy: Observations of the cosmos is done in this band.

Experimental: Numerous RDT&E testing as well as telecommand testing is performed in this band on a non-interference basis. NASA NIB use at Wallops Flight Facility and Kennedy Space Center includes RPVs.

73.000-74.600 Radio Astronomy

Radio Astronomy: Preferred for continuum observations. These observations help identify characteristics of stars, planets, and gases such as their elemental composition, temperature, etc.

74.600-74.800 Government Fixed/Mobile and Private Land Mobile (Part 90)

Military LMR: Usage range from administrative land mobile nets to ground communications for military aircraft crews.

Non-Military LMR: Usage ranges from portable-to-portable communications to low-power communications inside power plant facilities to the remote control of devices.

74.800-75.200 Aeronautical RadioNavigation: Aviation (Part 87)

Aero-Radionav. Used for instrument landing system (ILS) marker beacons that provide guidance information during approach and landing.

75.200-75.400 Government Fixed/Mobile and Private Land Mobile (Part 90)

Non-Military LMR: Usage ranges from public safety operations to low power operations to the remote control of mechanical devices.

Military LMR: Usage ranges from military runway light control systems to aircrew ground communications.

75.400-76.000 Fixed/Mobile: Public Mobile (Part 22), Aviation (Part 87), Private Land Mobile (Part 90), Personal Radio (Part 95)

Broadcasting: Educational TV broadcasts on various Pacific islands.

Experimental. Equipment testing is performed on a NIB basis.

76.000-88.000 Broadcasting: Broadcast Radio (TV) (Part 73), LPTV, TV Translator/Booster (Part 74G), Low Power Auxiliary (Part 74H)

Broadcasting: Government TV translator and educational TV broadcasts are licensed.

Military LMR: Used primarily for military services tactical and training operations on a NIB basis.

FED FILES

GOVERNMENT COMMUNICATIONS

Chris Parris
chrisparris@monitoringtimes.com
www.mt-fedfiles.blogspot.com

Autumn Updates

As we head into the fall months, I thought I would provide updated information on some topics that we have previously covered in the *Fed Files* column. Instead of a "Spring Cleaning" edition, here is the *Fed Files* "Fall Update" column, with recently received information on federal agency communications.

❖ Justice Department 25 Cities Project

In the January 2007 and July 2008 issue of *Monitoring Times*, I revealed the details and frequencies involved with the Department of Justice's "25 Cities Project." The 25 Cities Project was developed at the request of the House/Senate Commerce, Justice, and Science Appropriations Subcommittee staff in 2003 to provide federal law enforcement and homeland security agencies with the ability to interconnect and communicate with key local authorities in 25 "high risk" metropolitan areas. In some cases this interconnection was done through existing radio systems, but in many cases new federal radio repeaters were installed.

The interoperability solutions for each city seem to be based upon what is available to the area public safety agencies and what might be the best way for federal agencies to communicate amongst themselves and other agencies. Some areas have multiple VHF or UHF repeaters and others have only single channel repeaters. Many of these cities have also wired interconnection to federal agency dispatch offices and can patch communications circuits between systems.

These federal radio systems are installed and maintained by the Justice Department, in most cases, the local FBI field office. These repeaters can also be used by Justice Department agencies for field operations as well. Some areas report surveillance operations on these channels, as well as weekly radio interoperability tests with other agencies.

Some information on the 25 Cities Project is available on the Internet, but much of it has not been updated in years and may not reflect the actual current project status:

www.npstc.org/documents/commtech/CommTech%20Presentation%2025%20Cities.pdf
www.cops.usdoj.gov/files/ric/Publications/wirelesscomm_ritter.pdf
www.search.org/conferences/2006interop/DOJ%2025%20Cities%20Fact%20Sheets.pdf
www.cops.usdoj.gov/default.asp?Item=1518

Web pages and documents available on line no longer have any frequency information available in them, but some system frequencies have been confirmed from my own local monitoring or by local reports. Here is a rundown of the cities involved in the 25 Cities project, and what the known radio systems are.

Unless noted with a CTCSS tone squelch value, all these repeaters are using P-25 digital mode with a P-25 Network Access Code or NAC of N653.

ATLANTA, GA
ATL FIO 170.4750 MHz

BALTIMORE, MD
BAL FIO 170.6625 MHz

BOSTON, MA – *UPDATE!*
Local listeners in the Boston area have reported that the "Boston FIO" channel has had very little use in recent times. The frequency was derived from a US Coast Guard channel used for natural gas terminal operations, but since the Coast Guard has started using the new P-25 "CG NET" channels, traffic on this frequency has pretty much dried up.

BOS FIO	165.3250 MHz
BAPERN FIO	167.4375 MHz, 167.9 pl – patch to BAPERN 470.7875 MHz
BPD FIO	158.9100 MHz

CHARLOTTE, NC
Federal agencies in the Charlotte region have access to the large Charlotte-Mecklenburgh County trunked radio system. A cache of portable 800 MHz trunked radios is provided to agencies such as DHS CBP & ICE, DEA, US Marshals Service, the Secret Service and the North Carolina Air National Guard.

CHICAGO, IL

CG CMD C	171.6875 MHz (CHICAGO COMMAND CENTRAL)
CG CMD N	170.8125 MHz (CHICAGO COMMAND NORTH)
CG CMD S	171.4375 MHz (CHICAGO COMMAND SOUTH)
CG TAC C	172.2125 MHz (CHICAGO TACTICAL CENTRAL)
CG TAC N	168.8875 MHz (CHICAGO TACTICAL NORTH)
CG TAC S	168.9125 MHz (CHICAGO TACTICAL SOUTH)

DALLAS/FORT WORTH, TX
DFW EAST 170.7250 MHz
DFW WEST 171.4375 MHz

DENVER, CO – *UPDATE!*
Originally, the project described the Denver Metro area was being served by a pool of 800 MHz trunked radios programmed to operate on local public safety trunked systems. It now appears that the 25 Cities Project has opted to install 5 VHF P-25 repeaters located around the Denver metro area.

DEN IO N	170.6625 MHz (DENVER NORTH)
DEN IO E	171.9875 MHz (DENVER EAST)
DEN IO C	171.4375 MHz (DENVER CENTRAL)
DEN IO S	172.1875 MHz (DENVER SOUTH)
DEN IO W	167.2625 MHz (DENVER WEST)

DETROIT, MI - *UPDATE!*
In the first version of the 25 Cities Project, federal interoperability in both the Detroit area and Michigan statewide was supported through the Michigan Public Safety Communications System (MPSCS). However, new information indicates that Detroit will also be getting a stand-alone VHF repeater for federal interoperability communications.
DET FIO 170.5625 MHZ

NORFOLK/ HAMPTON ROADS, VA
The Hampton Roads/Norfolk metropolitan area is using a single VHF repeater for federal interop use. Listeners have reported both clear and encrypted traffic on this channel, as well as weekly check-ins between the various agencies utilizing this system.
HRN FIO 165.7000 MHz

HONOLULU, HI – *UPDATE!*
In addition to having access to the local public-safety radio systems, federal agencies in Honolulu have several VHF repeaters for federal interoperability. The "LE-4" repeater is part of the NTIA nationwide interoperability channels available to both federal and non-federal agencies.

HNL FIO	170.6250 MHz
HNL FIO 2	168.9875 MHz
LE-4	168.1125 MHz, N68F
HNL FIRE	154.280 MHz, D364

HOUSTON, TX
Two VHF repeaters in the Houston area are now available for federal agency interoperability. These frequencies have also been referred to by FBI units as "L1" and "L2", which are the channel numbers in the FBI radios that were originally testing these repeaters.
HOU CMD 170.7250 MHz
HOU TAC 171.4375 MHz

JACKSONVILLE, FL
A single VHF repeater serves the Jacksonville area federal interoperability needs. This repeater can be patched to other area public safety radio systems if needed. The US Navy facilities in Jacksonville and Mayport have control stations that access this repeater.
JAX FIO 171.4375 MHz

LOS ANGELES, CA – *UPDATE!*
Two standalone VHF P-25 repeaters in the Los Angeles area service the 25 Cities Project:
LA FIO 1 163.1000 MHz
LA FIO 2 172.4125 MHz

In addition to these federal repeaters, the Los Angeles Regional Tactical Communications System (LARTCS) has been providing interoperability between federal, state and local agencies. The federal 25 Cities frequencies listed

above do not appear to be part of the LARTCS. Here is a rundown of the LARTCS frequencies that can be patched together:

California National Guard	036.5000 MHz
HEAR	155.3400 MHz
NALEMARS	155.4750 MHz, 156.7 PL
Coast Guard Channel 23A	157.1750 MHz
LA INTEROP D	159.0300 MHz
LA INTEROP C	159.1800 MHz
Federal UHF I/O	406.8000 MHz, 156.7 PL
LACSO MA-1	483.5875 MHz, 186.2 PL
LACSO MA-2	484.0875 MHz, 186.2 PL
LACSO MA-3	483.7875 MHz, 186.2 PL
LACSO MA-4	484.1375 MHz, 186.2 PL
LACSO MA-5	484.0625 MHz, 186.2 PL
I-CALL	866.0125 MHz, 156.7 PL
CLEMARS 8	868.5125 MHz, 156.7 PL

MIAMI, FL

MIA FIO	171.4375 MHz

MINNEAPOLIS/ST. PAUL, MN – *UPDATE!*

The original rundown of cities for the 25 Cities Project did not include the Minneapolis / St. Paul Metro area. Since then, the Twin Cities have apparently been elevated to be among the 25 "high-risk" cities (Sharp *Fed Files* readers will note that this brings the total number of cities to 26!). Both of these repeaters were heard on the air during the Republican Convention in late 2008:

FEDCOM MP	170.6250 MHz
FEDCOM SP	171.6125 MHz

NEW ORLEANS, LA

NOLA FIO	171.4375 MHz

NEW YORK CITY, NY – *UPDATE!*

The Big Apple has three repeaters available as a federal interoperability system. The VHF repeaters are using P-25 digital and the UHF repeater is analog.

NYC FIO	167.7875 MHz
NYC FIO2	171.1750 MHz
NYC FIO	414.7500 MHz, 82.5 PL

PHILADELPHIA, PA

PH FIO	171.4375 MHz

PHOENIX, AZ

Federal interoperability communications in Phoenix can use multiple radio systems. One is the Inter-Agency Radio System, or IARS. This is a series of VHF and UHF repeaters tied together to link agencies with dissimilar radio bands. Federal agencies also have radio consoles and portable radios on the Phoenix Regional Wireless Network (PWRN) and the Mesa Trunked Open Arizona Network (TOPAZ).

PORTLAND, OR

Federal agencies operating in the Portland area have access to the local 800 MHz public safety trunking systems. There are talk groups allocated for the various agencies sue, as well as control stations and radios available. The federal IWN trunked system is operational in and around the Portland metro area and there is some interconnection available between the IWN P-25 trunked system and the Portland area 800 MHz radio systems.

SAN DIEGO, CA

San Diego area federal agencies can make use of the San Diego City and County 800 MHz trunked systems with control station and portable radio access. Communications dispatchers also have the ability to patch from their trunked systems to some federal "mutual aid" or "multi-agency" channels. These channels are not directly related to the 25 Cities Project, but are part of the DHS Border Patrol P-25 network throughout southern California. Listeners have reported patches between these federal frequencies and other agencies:

MA-4 SP	166.9125 MHz, N245
MA-4 PM	167.3750 MHz, N249
MA-4 DM	167.5250 MHz, N247
MA-4 MCC	167.7250 MHz, N244
MA-4 CP	170.8375 MHz, N248
MA-1 CP	171.1750 MHz, N362
MA-1 PM	172.2875 MHz, N363
MA-1 SP	172.4500 MHz, N148

SAN FRANCISCO, CA – *UPDATE!*

The Bay Area recently received some upgrades to their federal interoperability system. There now appear to be two VHF and two UHF federal repeaters in both analog and P-25 digital:

SF FED-V	171.6127 MHz
SF FED-U	410.4125 MHz
SF MA V-A	168.7625 MHz, 167.9 pl
SF MA U-A	409.0125 MHz, 167.9 pl

In addition to these federal repeaters, the interoperability system includes these state and nationwide public safety channels:

CELMARS 7 / LLAW	45.8600 MHz, 156.7 pl
SF MA T-A	483.1375 MHz, 156.7 pl
8TAC94	851.0125 MHz, 156.7 pl / 866.0125 MHz, 156.7 pl

SEATTLE, WA

The Seattle / Tacoma, WA metropolitan areas are served with several large 800 MHz trunked radio systems. Federal interoperability in these cities relies on control stations and portable radios that can access these trunked systems. It also involves patches to these systems as well as the federal IWN trunked system.

ST.LOUIS, MO

STL CALL	171.4375 MHz
STL TAC	171.6875 MHz

TAMPA, FL

TAM FIO	171.6875 MHz

WASHINGTON, DC

DCIO 1	159.1500 MHz, MPD Citywide Patch
DCIO 2	168.8750 MHz

In addition to the above interoperability channels, there were plans for three additional repeaters, but they do not appear to be on the air at the time this column went to press:

DCIO 2 N	173.7500 MHz
DCIO 2 S	168.0875 MHz
DCIO 2 W	166.7875 MHz

❖ Federal Satellite Systems

In addition to these land-mobile radio systems, the 25 Cities Project also features interconnection through the SkyTerra satellite communications system. This nationwide, privately owned satellite system offers data and voice communications via mobile and fixed satellite links. You can find out more about the SkyTerra service at their web site, **www.skyterra.com/**.

The mobile satellite transceiver sends and receives signals to and from the satellites in the L-Band radio spectrum (1500/1600 MHz), and the mobile unit can operate as either a duplex telephone or a push-to-talk two-way radio. For a good overview of how the satellite system operates, check out this web page: **www.satmagazine.com/cgi-bin/display_article.cgi?number=942910231**

A portion of the Sky Terra system is set aside for use by the US Justice Department, and has been designated as "J-SMART," or Justice Satellite Mutual Aid Radio Talk groups. These talk groups can be patched to local land-mobile radio systems so that the satellite link appears as a conventional or trunked radio on the local radio system.

Other federal agencies, such as FEMA, US Marshals Service and DHS also utilize the SkyTerra satellite network. In the March 2008 *Fed Files* column, these pictures appeared of a Department of Health and Human Services (DHHS) mobile command post equipped with a mobile satellite terminal using the SkyTerra federal government talk groups.

❖ VHF "Mystery System" Update

Back in the November 2009 issue of *Monitoring Times*, I mentioned a "mystery" network of encrypted VHF P-25 repeaters though out the upper Eastern Seaboard of the US. There was some speculation about what agency used this network, but no one had much solid information about it. Now I have been able to confirm some additional material on this network and who is using it, making it less of a mystery now.

Immigrations and Customs Enforcement (ICE), a bureau of the Department of Homeland Security (DHS), operates this system of linked VHF repeaters through New Jersey. For those who speculated that this was an ICE network, you win. These repeaters can be operated as a wide-area network, with multiple sites linked together, or as individual repeaters with local area coverage. The same frequencies can be used as simplex channels as well.

All of these repeaters utilize a common P-25 digital NAC or Network Access Code of N9C5 on the output. But some have reported observing different NACs on some occasions. Almost all the traffic has been reported as being encrypted. Here is a list of suspected locations of these ICE repeaters in the Garden State:

167.7250 MHz - Trenton
167.7750 MHz - Long Beach Island
170.3375 MHz - Swedesboro
171.6875 MHz - Newark
171.7500 MHz - Morristown
171.9875 MHz - Philadelphia
172.2125 MHz - Atlantic City

More "mystery" systems are being discovered out there and I will have more information on them as the information can be confirmed.

That's all for this edition of the *Fed Files* – be back in November for our last column of the year!

BOATS, PLANES, AND TRAINS

TRAINS

Ernest Robl
ernestrobl@monitoringtimes.com

Notes from a Slow Summer Month

Early July, when this column was written, is a slow time for railroad-related news, so I'll use these pages to catch up on several subjects.

❖ Small changes, big difference

I use two primary scanners to listen to railroads: one mounted in my car and the other a hand-held unit. The hand-held is a basic Radio Shack radio purchased several years ago, which has served well.

If I begin the day with fully charged batteries and a clip with additional standard batteries, I am assured that I have more than enough power to have the unit on all day. In fact, I've never exhausted the rechargeable batteries before I returned home.

While I'm in my car, I use the car-mounted scanner, which, with its 12-volt car power supply and external antenna optimized for the railroad band, usually pulls in signals from much further away.

Of course, there are times when I'm not in my car for extended periods, such as while traveling by train or while hiking around in a scenic area. There, I've often wished that the hand-held unit had more range and was more convenient to use.

My upgraded portable scanner helped me get this nice early morning image of Norfolk Southern train 350 approaching my hometown of Durham, N.C. I had just watched Amtrak train 73, the early morning southbound Piedmont train, pass this location headed away from me (with the lighting all wrong for a photo), when I heard the crew of the Amtrak train talk to NS 350 as the two trains met each other at nearby Funston siding. That prompted me to stick around and wait for 350 to emerge from the woods on this curve, with the train's engines working hard to accelerate the train out of the siding.

Power switch mechanism. This power switch is part of a cross-over, which in turn, is part of the Boylan Interlocking in Raleigh, N.C. The covered sheet metal channels outside the rails are part of the switch heater, which during precipitation in below-freezing weather, keeps the switch from freezing up or being blocked by ice or snow.

Convenient to use? Well, I generally use my scanner in connection with photography of railroads. That means the scanner is clipped to my belt or to my camera bag. The internal speaker is sometimes difficult to hear while in those positions.

So, I recently made two changes, which added considerably the scanner's functionality. The first was replacing the stock antenna with a Diamond RH77CA, after hearing others praise its performance. The Diamond antenna is twice as long as the stock antenna, but does not get in the way, considering how I carry the unit. I found the antenna did indeed make a difference in pulling in more distant and weaker signals.

The second major change was adding a remote speaker.

You've seen police officers and other emergency workers with their portable radios located at their belt, but with a remote speaker/microphone located near their shoulder. Years ago, I had invested in a couple of these small remote speakers, but never used them much. (One from Radio Shack had a coiled cable.)

With a little experimentation, I found that the Radio Shack speaker with the coiled cable worked great when the scanner was clipped to the rear of my small photo bag. I ran the cable up the back of the shoulder strap, using Velcro cable ties to hold the cable in place. The speaker is clipped to the front of the shoulder strap.

Yes, I also carry small earphones for possible use in public areas, such as aboard a train. Amtrak's policy is that "personal entertainment" devices should have earphones to avoid bothering other passengers. But, on my most recent train trips, the cars that I was traveling in were lightly occupied, and there was no one seated next to me. As long as I kept the scanner speaker turned down, it didn't appear to bother anyone, and the crew never asked me to switch to earphones.

In fact, on the most recent trip, the conductor stopped by to see if I had heard anything interesting by listening in to the crew. Well, yes, I got some good insights as to why the train encountered delays at a few locations – and why the train was or wasn't able to make up that time later.

❖ Automated messages

On a car trip to Alabama (from my home in North Carolina) earlier this year, while passing two major railroad yards hundreds of miles apart, I heard, for the first time, what appeared to be new automated radio voice messages. These consisted of an identification number and either "Brake restoration in progress" or "Brake restoration complete." Each message was usually repeated several times, making it obvious that these were indeed pre-recorded messages.

On returning home, I checked with a friend who's been in the railroad industry for many years. He informed me that these messages came from remotely operated switching locomotives controlled by an operator on the ground, rather than in the locomotive cab.

As the remote control console does not give the operator indication of brake pipe air pressure – though the operator can apply and release brakes from his console – the voice messages give that operator confirmation that the air pressure is being pumped up and that it has reached the appropriate level.

This is an important safety measure, as attempting to move a train, or even a cut of cars being switched, without adequate air pressure can be dangerous. Lack of air pressure would result in insufficient force to apply the brakes.

More on "Out of Correspondence"

In the past two columns, I devoted considerable space to ATCS Monitor, a program that lets railfans and others monitor track occupancy and dispatching operations on personal computers.

One subject I covered last time was "out of correspondence" indications on dispatcher displays – situations where the equipment in the field reports a condition that does not correspond

with what the dispatcher has requested. I noted that brief out of correspondence indications are normal, while the equipment in the field processes the commands from the dispatching center and moves and locks the switches.

I also noted that a prolonged out of correspondence indication usually means there is a problem out in the field requiring the attention of an employee.

There's one situation, however, where you may see a prolonged out of correspondence indication on an ATCSM display that does not indicate a problem. That's when a crew in the field, with permission from the dispatcher, has taken a power-operated switch off-line and placed it in manual operation mode.

If it's necessary to do substantial switching at the end of a remotely controlled siding, it may make more sense for the crew working there to operate the switch manually. Taking a switch off-line is a multi-step process. Once permission has been received, the crew in the field unlocks the heavy-duty padlock that secures the switch mechanism against tampering.

Then, a large lever is moved to disengage the switch motor. Only after that has been done, a second lever is used to manually move the switch points.

❖ Multiple tracks

Another topic covered briefly last time was the difference between long sidings and multiple tracks. Length is not really the deciding factor. How the tracks are designated in the employee timetable, which covers operations on that line, is the crucial point.

As with everything else related to railroad operations, being able to unambiguously communicate instructions and status information is the prime reason that each situation needs to be clearly described.

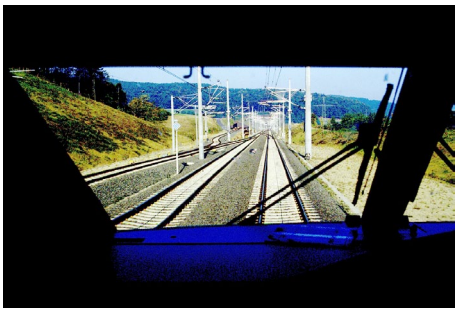
In the case of a siding, whether controlled with signals operated by a dispatcher or with track warrants, you will have a main track and a siding. If a track inspector or maintenance worker requests "track and time" for a particular location, he or she will be granted authority to use either the main track, the siding, or both.

If the employee is granted access to only one of those tracks, train operations may still continue on the other track.

There are rare situations outside of yards, where you have more than one siding at a location. In that case, on an east-west line, one of the sidings would be designated the northward siding and the other the southward siding, which relates to the siding's location relative to the main track, not directions of train movements.

In multiple track territory, tracks are designated numerically. You will have track 1 and track 2 (and so on). Railroads have rules as to how they number these tracks. On a north-south line, for example, tracks are usually numbered from east to west. The easternmost track is track 1.

All communications related to operations in that territory reference track numbers. When there are "talking" defect detectors in such territory, the automated messages from the detector report on which track a train is being scanned, as it is possible for trains to be simultaneously going through detectors on adjoining tracks.



View from the engine of a German ICE high-speed train doing more than 150 miles per hour. This photo was made back in 1991! Note the continuous antenna running between the rails that is used to communicate data and instructions between the dispatching center and the train.

When the crew on a train calls signals, it will include the track number, such as "Amtrak 73, clear signal at Podunk, track 2 southbound."

Signal identification numbers are normally based on milepost locations, down to a tenth of a mile. In single-track territory, a signal located at milepost 246.4 would have the identification plate 2464. In multiple tracks, the signal would have a prefix with the track number. In other words, if the above situation applied to multiple track territory, you would have signals with the identification plates 12464 and 22464.

As with all rules or practices, there are exceptions to the provisions for track numbering. On the CSX line between Richmond and Washington, D.C., the former Richmond, Fredericksburg, & Potomac (RF&P), there are long sections of double track where the two tracks are numbered track 2 and track 3. At some of these locations, there once was a track 1 that was removed; at other locations there was the intention of providing an additional track on that side of the line, but the track was never built.

❖ "Hot rail"

On a June Amtrak round trip between my hometown of Durham, N.C., and Charlotte, N.C., I heard a radio transmission that I hadn't heard in a while – "Hot rail."

This call has nothing to do with heat. It means that there is an imminent train movement on a particular track. As our train approached a track crew working on the adjacent track, the foreman called out on the radio, "Hot rail, track 2!" to alert others in the area about the approaching train.

If you are out monitoring railroad transmissions at trackside, always pay attention to calls of "Hot rail." While common sense and basic safety mean that you shouldn't be on the right of way to begin with, if you hear a call of "hot rail," be sure you are far enough back not to cause any concern to the crew of the approaching train.

❖ "High-speed" rail?

As I am writing this, money has begun trickling to the states from the initial series of grants of the Obama administration's "high-speed" rail initiative.

What does this mean for those interested in monitoring railroad activities? Well, for one thing, with the possible exception of two projects, this will not mean true high-speed rail will be coming to a place near you anytime soon. (Those two major projects, which would cost many billions, are in California and Florida, and both still have major issues to be resolved.)

On the other hand, the federal initiative will mean more and somewhat faster passenger trains in multiple parts of the country. Perhaps it's not right to characterize checks in the millions of dollars as a "trickle" – but considering that new locomotives, new high-capacity passenger cars, and a mile or two of new double track or siding all cost multiple millions of dollars, a few million dollars don't go very far.

Most of the grants are going to states that have already invested heavily in improved passenger rail services and will help those states make additional improvements. In June, North Carolina added a third daily frequency in the Raleigh-Charlotte corridor. Its recently awarded federal grants will go to further track improvements and additional equipment that should lead to a fourth daily round trip within the next two years – and speed increases for all of the existing trains.

Additional routes to the far eastern and far western parts of the state have long been on the drawing boards and have had considerable planning work already done. (The same is true in other states that are actively pursuing passenger rail initiatives.)

High-speed rail is really an inappropriate term for most of the federal initiatives, as, in the rest of the world, high-speed rail is considered anything above 150 mph. I've been on those trains in both France and Germany. But, as great as those trains are, they are also somewhat boring. They whoosh along between major cities and fly through open countryside where there often isn't much to see.

Of course, Europe has also long had an extensive network of conventional passenger trains, many of which are capable of speeds above most of what Amtrak has to offer. In Europe, new conventional passenger equipment for international trains – even equipment *not* built specifically for dedicated high-speed lines – now has to be capable of operating at 200 km/h. That's 120 mph.

On the dedicated high-speed lines in Europe, almost all communication between trains and the dispatching center, including signal indications and allowable speeds is through digital data links.

On the other hand, the increased number of passenger trains – and faster speeds for them on American lines – will result in more activity around existing stations and more dispatching challenges for the freight railroads on whose lines these trains operate.

More and faster trains require infrastructure improvements, including better signal systems and more places for trains to pass or meet each other. North Carolina, for example, already has planned for additional sidings and more double track in the Raleigh-Charlotte corridor, work which will begin as the money becomes available.

GLOBALNET

Exploring the World of Internet Radio and Television

Loyd Van Horn, W4LVH
loydvanhorn@monitoringtimes.com

In on the action - wherever it may be!

When news breaks, the common reaction for most people is to turn the television to their favorite news channel. There are those, however, who prefer to turn on their scanners and listen to the unfiltered information live, directly from the scene.

But what if there is no breaking news where you live? What if the action is thousands of miles away? Oh, to be able to tune in scanner transmissions from the hotspots of police and fire activity without having to ever make the trip!

As with just about everything else the radio hobbyist has enjoyed for decades, scanner audio is becoming an increasingly significant portion of the streaming audio hobby.

With so many choices, where do you start?

I found a great place to begin was at the **Live Scanner Audio Yahoo Group**. Here, not only can you find information on global scanner streams, you can also find like-minded individuals to converse and share information with.

Available at the Yahoo group are links to police, fire, EMS, ham radio, HF radio, airport traffic and even shortwave radio broadcasts.

Another excellent source of information for streaming scanner audio is **Radio Reference.com**. Here you can find a Live Audio link that will allow you to search for feeds from across the U.S. The feeds are broken down additionally into categories such as "Top 50" feeds, "New Feeds," "Official Feeds," and more. Navigating the feeds list is very easy and it seems to be very comprehensive, with nearly 2,000 feeds available.

In addition to these sources, one can also find scanner streams in other places.

Television station KOMO in Seattle, WA has provided streaming audio of local scanner audio on their Website, and provide additional links to other scanner audio Web sites. To me, this seems a logical extension of their information services that more television stations and newspapers should be doing.

Smartphone users also have a large number of applications available that provide streaming scanner audio. For instance, those using Apple's iOS products can do a search at the App Store for 'scanner' and find a number of applications available.

In fact, as a testament to the popularity of streaming scanner audio, the 5-0 Radio Pro Scanner App was in the Top 100 most downloaded paid applications in Apple's App Store as of presstime.

Overall, there are a number of options

available to those interested in the exploding streaming scanner hobby. Do you have a favorite source of scanner streams you like to use? Email me at the email address at the top of this column and I will share them with our readers!

❖ Sounds of the storm

Most amateur radio operators are very aware of the Hurricane Watch Net that activates on 14.325 whenever a hurricane is forecast to be within 300 statute miles from making landfall anywhere in the Caribbean Sea, the U.S. mainland and Central America.

For decades, hams have provided critical communications into and from the affected areas of hurricane landfall through the HF net. Now, even those without HF receiving capabilities can keep track of the action.

A stream to monitor the net is available when the net activates. September is the peak month for tropical storm activity and there should be plenty to listen to this month on the net stream.

I recall with great clarity as a child listening to hams on the Hurricane Watch Net sending communications into areas where all other means of communicating were cut off. The Hurricane Watch Net is the essence of the service that amateur radio operators can provide in times of disaster when emergency communications can often mean the difference between life and death.

In addition to providing first-hand reports of damage from storm-battered locales, the stream can serve to broaden the dissemination of messages regarding the health and safety of people in the landing zone.

For those who love weather or information directly from the scene of breaking news, the Hurricane Watch Net is a fantastic option to consider this season. A link to the Hurricane Watch Net stream can be found in the table at the conclusion of this column.

For those who enjoy tracking hurricanes, the technology of the Web has brought us very far from the days of charts on the wall. Today, there are thousands of sources for information on tropical storms. One of my favorites is StormPulse, which features a wealth of storm information on not only named storms, but also areas of potential development. A link to StormPulse can also be found in the GlobalNet links table.

❖ Portable EchoLink?

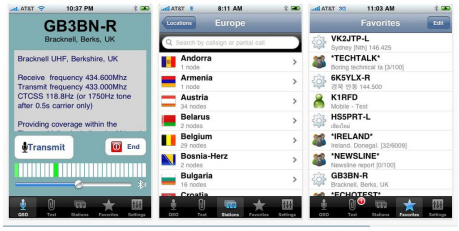
If you are a ham who loves the convenience of EchoLink, but you wish you could take it with you anywhere you go, the new EchoLink app for iOS devices is here to solve your problem!

EchoLink is a computer program that connects with amateur radio operators around the globe, mostly through repeaters synced to a computer. Thus, amateurs are able to have conversations with other hams worldwide, through the Internet. The premise works in the same way that VoIP programs such Skype and Vonage work.

Before downloading the iOS4-tested application, you must first download a copy of the Echolink program to your computer and validate your amateur callsign. Once you have done this, you simply download the application, log in to your EchoLink account, and you have access to EchoLink repeaters in the palm of your hand!

A growing number of amateur repeaters are popping up on EchoLink, and there are interfaces available so that amateurs within range of a repeater can dedicate a transceiver for EchoLink use.

For those using the iOS app, you are able to use the speaker and microphone of your iOS device to communicate through the EchoLink



repeaters. You can also use headphones for private listening. The free application is available through the Apple app store.

❖ iOS4 and streaming

Speaking of iOS4, I finally have had the opportunity to upgrade my iPhone's operating system to the new version. The new operating system has many improvements that iUsers have been begging Apple to include in their devices for quite some time. From a streaming standpoint, the one feature you will be most happy with is the ability to multi-task.

Slowly, developers are making their streaming applications iOS4 compatible. Within a few weeks of the new OS release, WunderRadio, ooTunes and Reciva had already upgraded their applications to support multi-tasking. Clear Channel's iheartradio application had not been upgraded as of presstime. On the scanner front, 5-0 Radio and LiveATC.net's apps are now iOS4 ready (Please note: These are as of presstime, based on my own observations and testing. There may be additional streaming apps that are iOS4 tested: see the documentation of applications to see if they are iOS4 tested before downloading).

Multi-tasking is easy in iOS4. Simply double clicking the home button of the iTouch, iPhone or iPad will bring up the multi-tasking window. So let's say you just opened up LiveATC and you want to run air traffic streams in the background while surfing the Web. Simply open LiveATC, start the desired stream, double click the home button and select Safari. That's it!

Another beneficial feature streaming enthusiasts will enjoy in iOS4 is the ability to organize apps into folders. Simply tap and hold on an app's icon. Then click and drag it to another application you want to group it with and select a folder name. That's it! Folders can hold up to 12 applications in iOS4. This was a handy way for me to keep all of my Internet Radio and Amateur Radio applications in easy-to-access folders.

❖ Subaru in-car WiFi hotspot

We are starting to see a push by automakers and cell phone companies to expand the use of mobile WiFi hotspots. There are now cell phones on the market that can take incoming cell phone signals and convert them to a WiFi signal, thereby providing WiFi access to several nearby devices.

Now, we are seeing similar technology coming standard in automobiles. Subaru recently announced they would begin putting WiFi hot spot technology into the Outback models. Similarly, Ford and Cadillac have also been incorporating Internet-ready technology into their vehicles.

The Subaru Outback will be using AutoNet as the WiFi source within the vehicle. This is a service I mentioned last year in this column. Basically, AutoNet converts a 3G wireless signal into a WiFi signal in the vehicle via a mobile router. From there, any WiFi enabled product from laptops to iPads can surf the Web as easily as one would do from home.

AutoNet, even in the Outback, doesn't come cheap. While Subaru has promised to give drivers three months of the service for free, it is still a $499 additional charge upfront, plus a $35 activation fee, in addition to a $29 monthly subscription fee. While a bit costly for most cash-strapped consumers, the inclusion of AutoNet-type services into automobiles is another reminder that we are heading for an increasingly connected society, which is a dream-come-true for the streaming enthusiast.

If you are looking to provide WiFi access in your vehicle, but AutoNet sounds like it is too rich for your blood, you may talk with your cellular provider to see if they carry any phones that double as a WiFi hotspot. As mentioned earlier, there are several phones available on the market that can serve this purpose.

❖ GlobalNet Mailbag

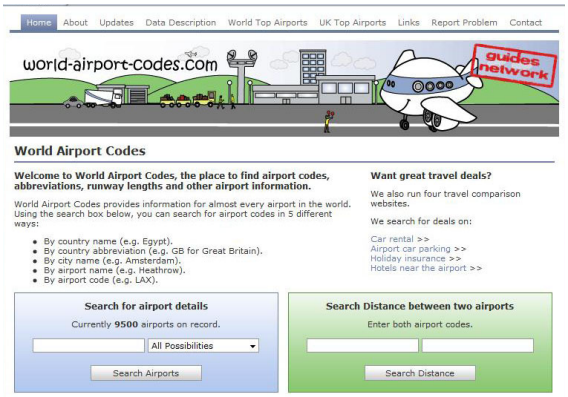
Loyd:

Read your interesting article in the last issue of Monitoring Times about Liveatc.net. I find that very fascinating. I have two questions if I may. How can one look up the ARTCC codes for airports in a given city? I have seen maps on TV news shows that show a plane symbol for all aircraft in the air for any given time. Would such a thing be available on the internet?

Thank you. David.

Thanks for the kind words David! Regarding the ARTCC codes, there are several ways you can access these on the Internet. I found one terrific Web site devoted to general airport codes at World Airport Codes (see link below). They provide an easy way for you to search by city name and get the 3-character code for that airport. (TIP: when searching for U.S cities, just enter the city name, without the state abbreviation.) The codes for each 'center' can be found at the MilAirComms Web site provided in the links table below. You can also find the frequencies for each 'center' here.

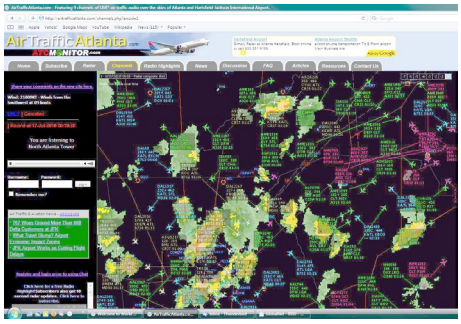
For general flight tracking, I recommend FlightAware. They have inbound and outbound flight tracking for many of the major airports



around the country with information on each flight. Once you have found an airport you want to listen to on the LiveATC.net Web site, many will have a link for flight activity that will take you to the FlightAware tracking page for that airport.

If you are looking for flight tracking into and out of Atlanta-Hartsfield, AirTraffic Atlanta (formerly ATC Monitor) is a fantastic source of information. They provide the live audio with a large map of all flights being routed through the Atlanta air space with an embedded weather radar! They have audio and maps for nine different channels: Northeast Atlanta Center, North Atlanta Tower, South Atlanta Tower, North Atlanta Final Approach, South Atlanta Final Approach, North Atlanta Ground, South Atlanta Ground, Atlanta Clearance Delivery and North Atlanta Departure. This is the busiest airport in the world, and that makes for some very interesting listening and viewing!

Hope this helps, David, and will provide you with hours of listening (and viewing) pleasure!



GLOBALNET LINKS

StormPulse – **www.stormpulse.com**
Hurricane Watch Net - **www.hwn.org**
LiveATC.net – **www.liveatc.net**
AirTrafficAtlanta – **www.airtrafficatlanta.com**
FlightAware – **www.flightaware.com**
World Airport Codes - **www.world-airport-codes.com**
Subaru doubles as WiFi hotspot - **http://reviews.cnet.com/8301-13746_7-20010774-48.html**
AutoNet - **www.autonetmobile.com/**
Live Scanner Audio - **http://groups.yahoo.com/group/LiveScannerAudio/**
EchoLink – **www.echolink.org/**
MilAirComms - **www.milaircomms.com/artcc_frequencies.html**

BELOW 500 kHz

DXING THE BASEMENT BAND

Kevin Carey, WB2QMY
kevincarey@monitoringtimes.com

Build a Broadband Loop (Part IV)

This was intended to be the fourth and final installment of our article on building a single-turn, broadband loop for longwave (see **http://tinyurl.com/ygt39z7**). My goal here has been to chronicle my own experience in building and using this popular type of antenna.

Unfortunately, my loop is not working properly – at least not yet – and this is most likely due to a wiring error on my part or a component failure on the preamp board. Nevertheless, we will forge ahead, describing the interconnection of the various units in the hopes that you will have better luck than I did. Meanwhile, I will troubleshoot my system and hopefully report back with good news next month!

What I'm experiencing thus far is a slight rise in background noise when I connect the DC power (a good sign), but no actual signals being received. However, when I handled the preamp board to look for problems, I noticed that signals suddenly boomed in when I touched certain traces on the bottom of the board. Unfortunately, there was little or no directivity to the antenna under these conditions as I rotated the loop.

I suspect this means that I was acting as the antenna while holding onto the board, and that the amplifier itself is working. In effect, the system was behaving as an omni-directional active antenna when I touched the board. Armed with this clue, I will focus my troubleshooting on the connections between the loop and the preamp board input. With luck, I'll be able to correct the problem quickly. For now, let's get on with final construction details for the rest of you.

Where We Stand

Last month, we discussed construction of the coupler circuit which connects between the loop, your receiver, and the DC power supply. The coupler is a simple unit made with just five components and it allows the DC supply voltage to "ride" on the same coax that carries RF signals. We'll now describe setting up the antenna for ground testing, and making connections to the coupler.

Ground Support

First, you will want to have some sort of temporary support for the antenna so you can test it on the ground prior to mounting on a roof or other elevated support. I used a standard-sized tripod just sitting on the lawn, into which I inserted the antenna mast with the loop attached to one end. My mast consists of a 10-foot length of 1.5" diameter white PVC (schedule 40) pipe.

Figure 1 shows my antenna on a mast, ready for testing. For improved stability (especially if it is breezy) you may want to attach "footer boards" to each leg of the tripod.

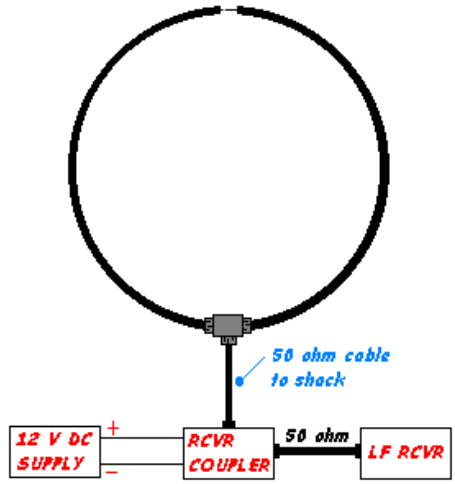


Figure 1. Antenna Mounted to a Mast, Ready for Ground Testing. (Photo by author)

Making Connections

To prepare the antenna for use, just follow the diagram in Figure 2. Make sure the connections are secure, and that shielded cable is used for all RF connections. When DC power is applied, you should notice a rise in background noise, and LF signals being received.

Figure 2. Interconnection Diagram for Loop Antenna (Diagram courtesy of Steve McDonald, VE7SL)

Initial Checkout and Tuning

Tune to a local/strong beacon and check the operation of the antenna. As you rotate the loop, you should notice a pronounced "null" at two points, exactly 180 degrees apart from each other. The nulls should occur off the broadside of the loop, which will be facing in the direction of the transmitter. Note that this is the opposite response pattern from a multi-turn box loop, where the null is seen off the ends of the antenna frame.

Next, carefully tune through the longwave band, listening for AM broadcast interference. This should be done with the antenna aimed in various directions. If you find any interference (most likely if you live near a broadcast station), slowly adjust the slug of transformer L1 on the preamp for a null in the interference. Hopefully, you'll be able to null out the offending signal completely.

Final Mounting

Give some thought to where and how you want to mount the antenna. I like to use an existing support whenever possible, such as a chimney or solid vent pipe. Whatever you use, try to mount the antenna in the clear, and as far away from wires or other antennas as possible.

Obviously, you'll want some way to rotate the antenna to take advantage of the loop's directional properties. A simple TV-type rotator is more than capable for the job, as this antenna is lightweight and has a small wind load. Calibrate the rotator for accurate bearings, and you are done. A lightning arrestor should be used on the feedline leading to your shack.

As I mentioned, I'll be troubleshooting my antenna over the next few weeks and hope to have a resolution to the problem next time. I'd like to hear from others on their experience with the antenna, and what worked well for them. We'll share any tips you may have if you'll take a moment to write via postal or e-mail. Happy looping!

❖ From the Mailbag

We are pleased to hear from **Lane Denune, KD8IIC**, (OH) who writes: "Hi Kevin, I've logged some neat (for my first attempt) NDBs here in Columbus, Ohio. Equipment used is an Icom R75 and a 38-inch Pixel Pro-1 Shielded Loop antenna with a rotor."

Great to hear from you, Lane, and thanks for writing. I noticed that you have multiple catches on several of the frequencies shown. This points out one of the key advantages of a directional antenna. Nice work, and we hope to hear from you again. See Table 1 for Lane's loggings.

TABLE 1. SELECTED BEACON LOGGINGS

Freq.	ID	Location
212	OZ	Ft. Rucker-Ozark, AL
235	9H	LaGrande 3, QC
248	FRT	Spartanburg, SC
257	SQT	Melbourne, FL
332	FIS	Key West, FL
344	JA	Jacksonville, FL
350	RG	Oklahoma City, OK
350	LE	Raleigh, NC

356	PI	Peoria, IL
365	AA	Fargo, ND
365	FKV	Gainesville, GA
382	APT	Jasper, TN
382	MW	Marion, IL
384	JB	Lumberton, NC
385	TKL	Tikal, Guatemala
385	YNC	Wemindji, QC
385	EMR	Augusta, G
386	SP	St. Pierre, SPM
388	RNW	Chocowinity, NC
388	CDX	Cumberland River, KY
388	CFJ	Crawfordsville, IN
403	BPO	Oneida, TN
404	XW	J.E. Bernier (CCGS Ship)
432	IZN	Lincolnton, NC

Reader **Jim Pedersen** (CA) reports that he has been doing some exploration on the frequencies of 60 kHz and below, but he's been going about it in a somewhat unconventional way. Instead of using a traditional receiver, he uses an external soundcard with his PC, and a suitable antenna to receive VLF signals.

His soundcard is an E-MU 0202 USB 2.0 by Creative. The E-MU 0202 when set to 196 kHz sampling rate allows him "see" up to 90 kHz plus before rolling off. Some of Jim's receptions are shown in Table 2 below. The italicized entries require further discussion (see text following the table).

TABLE 2. VLF LOGGINGS FROM CA

Freq.	Station	Bearing (Degrees), Location
19.8	NWC?	102/282, Australia?
21.4	NPM	70/250, Hawaii
22.2	NDT?	324/144, Japan?
24.8	NLK	10/190, Washington
25.2	NML	65/245, North Dakota
60.0	WWVB	70/250, Colorado

Jim questions the locations of NWC and NDT, as the bearings he obtained from the San Francisco area do not agree with the published data he has found. The 19.8 NWC 102/282 degrees seems to be coming from the direction of Japan, and the 22.2 NDT 324/144 degrees seems to be coming from Alaska or Russia. Anyone have any information on these?

A useful listing of sub-80 kHz stations may be found online at **http://sidstation.lionel-loudet.homedns.org/stations-list-en.xhtml.** I see that there are several stations just above and below these frequencies which may be possibilities. Identifying these signals has always been a challenge, as most VLF stations do not ID on a regular basis, and any lists, such as the one mentioned, are from a conglomeration of sources, and are not guaranteed to be up to date.

It was my pleasure to meet many *Monitoring Times* readers at the Rochester Hamfest on June 5th, including **Todd Brown, AB2MS** (NY). Todd is getting back into longwave after a year-long hiatus, and is enjoying his new explorations. He writes: "Hi Kevin: After talking to you at the Rochester Hamfest I took your advice and went the converter route. I found an FRG-7 receiver with a converter built in, as well as added Collins filters and an external digital frequency readout. After some tracing wires and head scratching, I figured out how the converter was wired in, and now am finally back copying beacons after over a year. Hopefully I will have a nice log to send and show my results. Thanks again for the advice!"

Sure enough, Todd sent a link to his loggings a short time later, which can be viewed at: **www.qsl.net/ab2ms/ndbweblog_Fulton/ndbweblog.html.** Welcome back, Todd, and keep up the good work!

A few issues back, we discussed the dilemma of those wishing to build the Gyrator III VLF receiver. A PC board is available for it from FAR Circuits, but curiously, no schematic diagram could be found.

Well, **John Ciperano, K0EBC** (CO) wrote in with an answer to the problem. Complete project details can be found online at **www.astrofilimilano.org/corso/Lezione08_20080516_Pluchino_P1.pdf.** This article is in Italian, however. Italian not your native tongue? Don't despair, as the schematic itself has English references, and you should have little trouble figuring out the essential details.

For anyone wishing to build the earlier (and still very capable) Gyrator II VLF Receiver, the details are readily available online (in English) at: **www.aavso.org/observing/programs/solar/minimalVLF.shtml**. Beware, though, of an apparent error in the circuit diagram, spotted by **William Tobin**. The audio output is shown as coming from ground. William later wrote that he got the Gyrator II to work just fine, but I have not heard what the resolution was to the audio output issue. Just be aware that you may have to do some digging if you encounter problems.

See you next month!

AOR AR5001D Communications Receiver

By Bob Grove, W8JHD

The long-lasting AOR AR5000 series has been a reliable favorite among our government and military clients, but it's no longer available. While that may be a disappointment to our clients, it should be no longer. I've had the opportunity to bench-test its replacement, and it's a step up.

Like its predecessor, the new AR5001D takes some getting used to; not all of the array of multi-function pushbuttons are intuitive. But the girthy manual – nearly 100 pages in 8-1/2" x 11" format – is well written. It contains tutorial information for the less experienced user, while including information of use to the technically experienced listener.

❖ Layout

Although the panel dimensions are about the same as its predecessor (roughly 9"W x 4"H), its depth is considerably greater (12" plus knob and connector projections). It weighs about 11 lbs.

As revealed in the accompanying photos, the 5001D is resplendent with control functions on the front panel and access connectors on the back. Reinforced, screw-tapped holes on the sides invite rack mounting, and a tilt bail lifts the front off the desk for comfortable tuning.

The knobs are longer than in the former model making them easier to grip. They are rubberized as well, giving them a "military" look and feel. But the radio is not waterproof or splash resistant, so care must be exercised in its placement and exposure.

The illuminated, analog S-meter has three co-located scales: dBuV (decibels/microvolts) and S units. These are very small and hard to read even with glasses; larger numerals would have been preferable.

The back-lit LCD is a busy place, reporting a wide variety of settings such as frequency, antenna selected, squelch threshold level (dB), attenuation or preamplifier selection, mode, IF bandwidth, and tuning step. Alternative, temporary readings are presented when various settings are being selected.

The radio is powered by a nominal 12-14 VDC @ 2A source; a 120 VAC adapter is included. The DC jack is a conventional coaxial style, unlike the unfriendly three-pin plugs in previous AOR models.

❖ Features

Just how many functions and features can you put on a receiver? Let's take a look at what this receiver will do.

With continuous frequency coverage from 40 kHz-3150 MHz (3.15 GHz) (cellular blocked on the consumer model), this new receiver can search or scan (in voice- or mode-recognition options) as many as 2000 alphanumeric memory channels (in forty 50-channel banks).

Fast Fourier transform (FFT) technology coupled with direct digital synthesis (DDS) allow scan/search speeds of up to 1000 channels per second – that's fast! Search-discovered active frequencies may be auto-stored in memory. Any memory channel may be selected for priority during scan.

Frequency tuning may be accomplished in the conventional manner – rotating the tuning dial, or automatically by pressing the up/down keys.

It can receive up to three different frequencies simultaneously and can show real-time signal activity on its built-in spectrum display with an adjustable span from 0.4 to 10 MHz wide. And, by connecting the 45 MHz IF output to a suitable spectrum analyzer or spectrum display unit, a span of up to 15 MHz may be viewed.

The 5001D can be computer controlled through its RS232 and USB 2.0 ports. A front-panel slot accommodates an SD memory card for recording as well as displaying and playing back audio, data, information in WAV format.

For surveillance countermeasures assignments, it will deliver NTSC or PAL live video to an analog monitor attached to its rear-panel video connector.

IF selectivity bandwidths from 200 Hz-300 kHz may be chosen, and those signals may be further processed with an automatic notch filter, noise reduction and noise blanking, and even a speech inversion descrambler (not available on the consumer model).

Off the shelf it will decode CTCSS and DCS squelch as well as DTMF tones; with the P25-2300 option, APCO P25 is receivable as well. An optional I/Q output 1 MHz wide allows computer-decoding of shortwave DRM stations.

But it will not track trunked systems. Licensing fees for trunking are quite expensive for manufacturers, and since less expensive scanners are readily available to do the trunk tracking, it was decided to forgo the trunking option.

Also optionally available for the AOR receiver are a LAN unit for remote-computer control, and a GPS input for 0.01 ppm frequency control via the 10 MHz external time base input.

Strong-signal overload is significantly reduced by the 5001D's beefy third-order intermodulation rejection. (See the specifications chart for these ratings.)

An automatic frequency control (AFC) function tracks frequency-drifting narrow FM signals, such as those by satellite Doppler effects.

❖ Customizing the settings

Virtually every imaginable parameter of this receiver may be customized by the user. Of course, volume and squelch levels can be adjusted by the front-panel knobs. Tuning increments (frequency step) may be manually entered anywhere from 1 Hz to 500 kHz, or simply chosen from a selection of pre-programmed steps.

IF selectivity may be conveniently coupled to the chosen mode, and the tuning skirts are steep, allowing excellent adjacent-channel rejection. The attached specifications table shows the assortment of bandwidths available from 500 Hz to 300 kHz.

Automatic gain control (AGC) timing of fast, middle, slow, and off can be chosen. A selectable preamplifier for enhancing weak-signal reception, as well as a step attenuator to reduce strong-signal overload, are complemented by an RF gain control function.

If you are in an environment suffering from strong signal interference in the medium or short wave bands, you can select from eight different bandpass filters under 25 MHz.

❖ Let's check it out

I currently own an expensive, competitive, communications receiver, and it's a long-time favorite, so I was eager to see how the two radios faced up.

AOR advertises their new release as having high sensitivity, so my first exercise was to put

both receivers on the same beam antenna and rotate it toward a 432 MHz CW (Morse code) ham beacon on a distant mountain.

While the signal was readable with background hiss on both receivers, the CW filter on the AOR virtually suppressed the hiss, isolating the CW ID as a pure note.

❖ The spectrum display

Next, it was time to test the most obvious new feature on the AOR, the built-in spectrum display. At first blush, it resembles the bargraph signal display found on cheaper scanner receivers, but it behaves better than those.

Besides the graphic spikes, the display also reports center frequency (MHz), signal strength (dB), span width (MHz), mode, and tuning step interval.

For the vast majority of signal-intercept tasks, the internal display works fine; however, while the real-time refresh rate of the LCD display is able to catch on/off keying, it's not quite as fast as a cathode ray tube (CRT).

With the internal LCD spectrum display turned on and my CRT spectrum analyzer connected to the 45 MHz IF output jack, the CRT captured most of the rapid pulses of frequency-hopping WiFi signals in the 2.4 GHz range, but the internal LCD missed most of them.

Of course, if you need to catch pulses measured in milliseconds and also see the modulation skirts on the signal spike, you can attach an external spectrum analyzer or spectrum display unit to the 45 MHz IF output as I did.

Still, the internal display is fine for spotting two-way transmissions and steady carriers. And there is no display drift as suffered on inexpensive spectrum analyzers (like mine) which require constant touch-up to center the baseline. With the AR5001D, as soon as this receiver is turned on, the LCD display is locked on center with incoming signal spikes.

❖ One criticism

I was surprised by the number of images in the UHF range. For example, the entire 800 MHz cell phone band was reproduced in the 700 MHz range with only 15 dB attenuation. Other spurious signals like a local FM broadcaster and two-way base stations could also be found in the 700 MHz range.

Fortunately, nearly all of these spurs appeared in the UHF-TV spectrum which is of little interest to most users except for those who need to listen there for TV signals.

In all fairness, it must be pointed out that these spurs are no more severe on the 5001D than they were on the earlier 5000, and complaints about that were virtually nil. VHF and UHF land mobile, ham radio, and aircraft bands are virtually unintruded by those spurs. In the rare case where they do cause a problem, external antenna input filters can be applied to attenuate the offending frequencies.

I was initially concerned that when I activated the attenuator, there was no reduction in the signal level shown either on the S-meter or on the LCD display. Contacting the factory, I learned that the meter shows the signal levels at

the antenna, not after the attenuator; thus there would be no change in the reading. The attenuation had, indeed, been activated as it should be.

❖ The bottom line

The new AOR AR5001D is a hot performer, a measureable improvement over its predecessor. Its wide frequency range, built-in, real-time spectrum display, lightning-fast scan and search speeds, sharp filtering, and SD card file capability set a new standard of performance for the communications industry.

The AOR AR5001D (RCV-68G) is currently only available for government/military sale only. Qualifying agencies can contact Grove Enterprises for availability and current pricing. Sale price at press time was $3,899.95 from Grove Enterprises.

AOR is expected to release a consumer version of this receiver later this year or in early 2011. Watch for the announcement of that product here in the pages of *Monitoring Times*.

The new AOR AR5001D wide coverage receiver is available from Grove Enterprises for $3899.95, and from some other selected MT advertisers.

AOR AR5001D SPECIFICATIONS

These are manufacturer specifications and are subject to change without notice.

Frequency coverage: 40 kHz ~ 3.15 GHz (Cellular blocked on consumer version)
PC control ports: RS232 and USB 2.0
Spectrum display: 15 MHz span, fast-Fourier transform (FFT) with 0.1 second sweep for real-time presentation
Receive modes: NFM, WFM (stereo output), AM, Synchronous AM (SAM), LSB, USB, ISB, CW, AIQ (AF-IQ)
DRM compatibility: 12 kHz I/Q output for DRM PC receiver
Receive configuration: 40 kHz - 25 MHz, direct conversion;
25 MHz - 200 MHz, double conversion superheterodyne;
1st IF, 295 MHz; 2nd IF, 45 MHz
200 MHz - 420 MHz, triple conversion superheterodyne
1st IF, 1.7045 GHz; 2nd IF, 294.5 MHz; 3rd IF, 45 MHz
420 MHz - 3.15 GHz, double conversion superheterodyne
1st IF, 295 MHz; 2nd IF, 45 MHz
IF output: 45 MHz analog; compatible with AOR SDU 5600 with free firmware upgrade
IF bandwidths: 200 Hz, 500 Hz, 3 kHz, 6 kHz, 15 kHz, 30 kHz, 100 kHz, 200 kHz, 300 kHz
Decode configuration: DSP
Decode modes: CTCSS, DCS, DTMF, APCO P25 (with optional P25-2300 decoder)
CW pitch control: 300-1100 Hz in 50 Hz steps
S meter: S units and antenna input level (dBm and dBu selectable)
AGC: Fast, middle, slow, off
AFC: NFM mode only
Digital voice recording: SD card port
Video output: Composite analog NTSC and PAL for detecting wireless surveillance cameras
Clock: 12/24 hour selectable with date, time zone, sleep timer, and alarm (radio or beep)
Signal processing functions: Automatic notch filter, noise reduction, noise blanker, speech inversion descrambler (not on consumer version), IF shift, CW pitch, AGC, AFC, RF amp/att., tuning step, priority, memory channel, pass channel
FFT function: Search
Selectivity: CW: 500 Hz, 380 Hz (> -3dB), 500 Hz (< -80dB)
AM: 6kHz, 5.5 kHz (> -3dB), 6.9 kHz (< -80dB)
SSB: 3kHz, 2.7kHz (> -3dB), 3.1 kHz (< -80dB)
NFM: 15kHz, 14.2kHz (> -3dB), 15.6kHz (< -80dB)
WFM: 200kHz, 200kHz (> -3dB), 250 kHz (< -80dB)
IP3 (3rd order intermod rejection):
> +20dBm @ 14.1 MHz; > +12dBm @ 50 MHz; > +7dBm @ 620 MHz
IF output: 45 MHz (+/- 7.5 MHz) analog signal; digital I/Q (option) USB 2.0, isochronous B/W 1 MHz; 12 kHz offset
Frequency stability: 0.1 ppm coherent to 10 MHz reference oscillator; 0.01 ppm with optional GPS unit
1st local oscillator: Di
Sensitivity: (table below)

Frequency	AM	SSB	NFM	WFM
	10dB S/N 6 kHz BPF	10dB S/N 3 kHz BPF	12dB SINAD 15 kHz BPF	12dB SINAD 200 kHz BPF
40 kHz ~ 100 kHz	8 uV	2 uV		
100 kHz ~ 1.8 MHz	4 uV	1.2 uV		
1.8 MHz ~ 25 MHz	4 uV	1.2 uV		
25 MHz ~ 1 GHz	2 uV	0.3 uV	0.7 uV	1.8 uV
1 GHz ~ 2.4 GHz	2.5 uV	0.3 uV	0.7 uV	1.8 uV
2.4 GHz ~ 3.0 GHz	3.5 uV	0.5 uV	1 uV	3.2 uV
3.0 GHz ~ 3.15 GHz	5 uV	1 uV	1.5 uV	5 uV

Memory channels: 2000 alphanumeric memories
Scan/search speed: Up to 1000 channels per second
Memory banks: 40 (adjustable 5 - 95 channels per bank)
Search banks: 40
Priority channel: 1
Select memories: 100
Pass frequencies: 30 per search bank (1200 total)
Multi-frequency receive: Dual band (Two frequencies below 25 MHz):
Offset frequency (Two frequencies within 5 MHz)
Tri frequency: Combination of dual + offset
Spectrum display: Span width adjustable from 400 kHz - 10 MHz in 100 kHz steps
Frequency axis data: 160 dots
Frequency range: 40 kHz - 3. 15 GHz; not available in multi-frequency mode
Audio output: 2 watts into 8 ohm load @ 10 % THD
Audio filter: High/low pass adjustable, and de-emphasis
Audio output jacks: 600 ohm line, low impedance speaker
Operating temperature: 2 - 144 degrees F
Power requirement: 10.7 ~ 16.0 VDC (12 V DC @ 2 A); standard coaxial power jack with back panel DC switch
Dimensions (not including projections): 8.66"W x 3.82"H x 12"D
Weight: 11.1 lbs

MFJ-9410 Ten-Meter Transceiver

By Bob Grove W8JHD

After successful high-power, global contacts become routine, amateur radio operators often ponder the question, what could I accomplish using only low power?

The question is answered with a bold "quite a bit!" now that the sunspot cycle is returning and the ten meter band sporadically perks with signals. Ten meters is a favorite band among many seasoned hams who have discovered that it's not the power, but band conditions that formulate successful contacts.

While power levels of all conventional multiband ham transceivers can be reduced, it seems like overkill to possess a 100 watt transceiver and crank it down to only a few watts. Besides, that box remains big and heavy!

Several companies respond to the lure of QRP (low power communications) with cute little rigs, and this month we're going to take a look at one of them. The model 9410 from MFJ Enterprises is an example of several low-power, single-band transceivers available from that company.

Measuring 6-1/2"W x 2"H x 5-3/4"D and weighing about two pounds, the 9410 is inviting for back packing, picnicking, mobile/portable applications, emergency contingencies, and even as an ancillary radio in the shack.

The control panel is simplicity itself. A tuning knob adjusts the frequency (28.3-28.6 MHz), and a volume control selects comfortable audio from the internal 3" speaker.

A dual-function panel meter reports incoming signal strengths in S units, and also shows the audio processing level during transmit so that the microphone gain control can be set properly.

A key jack is provided for the dedicated CW operator, although an optional break-in module is required to activate that mode. A five-pin DIN connector is provided for a 600 ohm microphone for voice operation in the upper sideband (USB) mode.

The rear panel sports a conventional SO-239 ("UHF") female antenna connector, a microphone gain control, a standard DC power jack (12-16 VDC), a headphone jack for noisy environments or private reception, and an RCA connector to activate an external RF amplifier if higher power operation is required.

The receiver is a single-conversion superheterodyne, and it's hot! Sensitivity is 0.15 microvolts (-6 dB @ 2.3 kHz bandwidth), so reliable weak-signal reception is no problem. Audio power to the internal speaker is 1/2 watt, and its AGC-tempered gain has 70 dB dynamic range.

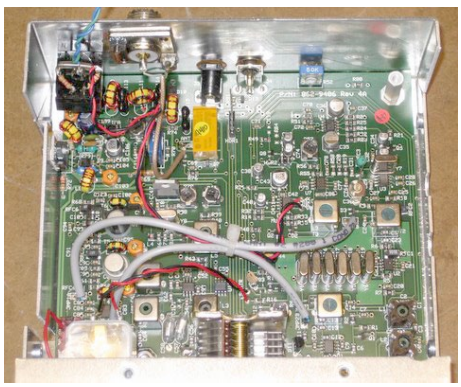
Current drain in the receive mode is 150 mA; disconnecting the meter-illuminating light substantially reduces the current for battery operation.

The transmitter produces 20 watts of PEP output while drawing about 2 amps of current from a 12 volt source. Filtering reduces spurious-signal output by 60 dB, and speech enhancement is provided by RF compression (syllabic rate).

❖ What's in the case?

The 9410 is fully analog; there's not a single digital device on the circuit board (See attached photo). The receiver's four-pole bandpass filter, followed by a low-noise amplifier, allows the 28.3-28.6 MHz spectrum to mix with a 38 MHz VFO, thus providing a 10 MHz intermediate frequency (IF) which, in turn, is shaped by a six-crystal ladder filter for a 2.3 kHz bandwidth. A 10 MHz BFO mixes with the IF signal to derive the audio.

The transmitter utilizes a conventional balanced modulator coupled to a 10 MHz LSB filter; this signal is mixed with a 38 MHz VFO to generate a 28 MHz signal. A heterodyne VFO mixes 6.3-6.6 MHz from a tunable oscillator with a crystal-controlled 32 MHz signal, which is then filtered to pass 38.3-38.6 MHz.



❖ Let's try it out

As a long-time fan of ten meters, I thought that this radio looked like just the rig to take on trips. I decided that the perfect package would be to complement the MFJ-9014 transceiver with an MFJ-290 mobile mike and an MFJ-4110 AC power supply.

MFJ's power supply configuration is interesting. The main transformer (#407-1109) converts 120 VAC to 14 VAC, not DC as with most power supplies. A separate accessory, the MFJ-4110 "adapter," (a full-wave bridge rectifier/filter) then converts the 14 VAC to 13.8 VDC to power the transceiver.

When the package arrived, setup was quick and easy – just plug it in and turn it on! Connecting the rig to my GAP Titan all-band vertical, I surveyed the ten meter band and heard a strong signal from Texas.

With great expectations, I squeezed the mike button and called the station. He responded! How about that – this thing actually works! That was the good news.

But the signal report I received was troubling; although it was strong enough to be heard, the Texan reported distorted audio. Nothing he could be specific about, it just didn't sound right.

Following that contact, I called another station and, sure enough, he reported distorted audio as well. Stations from California and Illinois provided the same report. Was there a problem with the rig? The mike? I decided to do some testing.

With a 50 ohm dummy load connected to the transceiver, I listened to my voice through another receiver. It sounded distant and shrill. Unfortunately, I didn't have another mike to try, so I contacted MFJ to effect their *"No Matter What™"* warranty policy.

After receiving the authorization, I forwarded the rig and mike to the factory, and within days it was returned postpaid with an informative note. Apparently, a new source for microphones did not properly match this series of transceivers, but the problem was being addressed by replacements. My rig had been thoroughly tested and was returned to me with a different mike.

Impressed with the speed and personal attention I was given, I was eager to put the transceiver on the air. I wasn't disappointed.

The first station I called – another Texan – immediately responded and gave me a strong signal report with excellent audio! The rig was fine – the mike had been the problem all the time. And as I finish this review, I've just gotten off the air after an enjoyable contact with a station in Minnesota who also gave me a fine signal report.

I'd have to look pretty hard to find fault with this rig. While it does drift slightly in frequency over time, a touch of the front-panel's fine-tuning control easily compensates for that. But after all, it's an analog oscillator, not crystal-synthesized, and the small drift is certainly tolerable.

❖ The bottom line

It's cute, it works well, and it's priced right. Nothing more needs to be said other than to listen for me on ten meters with my new MFJ-9410!

MFJ-9410 transceiver MFJ-290 mike, $289.95; MFJ-4110 power supply, $59.95. Also available from Grove Enterprises.

KAITO KA801 REVIEW

Many small, portable, AM/FM radios have been made with shortwave added as a secondary feature. It's always a pleasure to introduce a model that considers shortwave an important primary feature. Such is the new Kaito KA801, a thin pocket portable with many assets going for it, including a sturdy, soft-finished case.

It's small and light, measuring 4.3"H x 2.6"W x 0.6"D and weighing only 4 ounces, making it an attractive accessory. The backlit LCD is large and bold, viewable from several angles. A flip-out stand allows vertical positioning for bedside or desktop viewing. A soft velvet draw-string pouch is included for carrying the radio safely.

The 801 has full 87-108 MHz FM stereo (a set of stereo ear buds is included) and 520-1710 kHz AM coverage, as well as 2.3-23 MHz shortwave AM. An internal ferrite loop captures the AM signals, and a telescoping whip captures the FM and shortwave broadcasters.

225 memory presets allow storage of favorite frequencies – 100 on MW and SW, and 25 on FM. An AC adapter charges the internal, replaceable,

3.7V lithium battery. Battery charge life is approximately 8 hours of playing time.

Station tuning methods may be selected to suit your fancy – key-activated up or down automatic searching, or thumbwheel manual tuning. Successive presses of the SW key provides band stepping through the shortwave broadcast bands.

All settings may be locked by a sliding key on the side of the radio.

❖ MP3/WAV capability

Whether you want to use the digital recorder function for voice notes, recording off air, or loading your favorite stereo music from a computer, up to 2 GB of files may be recorded in its internal memory: that's some 140 hours at 32 kps. A standard USB2.0 connector allows interfacing to a computer.

❖ A busy LCD

The large display is loaded with information, which changes depending upon the mode of operation currently selected. In power-off status, battery charge level, local time to the second, as well as month and day are shown. An alarm/sleep timer function is included and can activate recording.

During shortwave operation, the frequency in megahertz (5 kHz increments), meter band, time, and relative signal strength (for the first ten seconds of new signal reception) are displayed. On medium wave, frequency in kilohertz, time, and relative signal strength (for the first ten seconds of new signal reception) are shown.

The MP3 recorder/player function shows folder and file numbers, volume level, playing status and playing time.

❖ The bottom line

I enjoy having this electronic companion with me when I take my collies for a walk. Its audio is clean and crisp from its internal speaker, and I can plug in the ear buds (provided) for personal listening, or stereo MP3/WAV and FM reception.

For longer periods away from my musical CDs, I can load hours of classical music into the MP3/WAV memory.

While no portable shortwave receiver will provide the performance of a dedicated desktop receiver connected to an outdoor antenna, the 801 gives a good accounting of itself. Just extend the 13" telescoping whip and prepare for global reception of the stronger international broadcasters.

Local AM reception is certainly acceptable as well, and the internal ferrite bar antenna offers sharp rejection of unwanted interference as the radio is rotated in its upright position.

All in all, this radio is a real pleaser at an extraordinarily low price. The Kaito KA801 is available for only $79.95 at Grove Enterprises.

SANGEAN CL-100 AM/FM/WEATHER RADIO

What? Another clock radio? Well, yes and no. Yes, this compact bedside accessory does tell the time, and it can be set with its alarm, snooze, and sleep time functions, and it does receive AM and FM broadcasts, but it also contains a weather receiver with SAME alert for your specific location. All NOAA weather channels are stepped through at the press of a panel key. In fact, virtually all functions are selected by easy key presses.

A 22" telescoping whip antenna, which can be swiveled to any position, assures optimum FM and NOAA weather reception. For even greater signal strengths, a pair of antenna and ground screw terminals is provided for an external AM antenna, and an RCA jack allows the connection of an external FM/weather antenna.

There are five memory channels each for AM and FM stations, with an autosearch function included. Station formats are displayed (name, radio text message), as are clock time and date. Three LEDs visibly announce the presence of weather warning, advisory, and watch transmissions. The wide-viewing-angle LCD display has both brightness and contrast controls.

Three separate 1/8" (3.5 mm) jacks are provided for earphones, an external weather alert, and input for an auxiliary source of audio.

The little CL-100 is powered by 6 volts, provided either by the 120 VAC wall adapter (included) or by four AA cells (not included). Dimensions are 7"W x 2"H x 4-1/2"D.

❖ The bottom line

We were favorably impressed with the little multi-function radio. It's easy to program, has clean audio even at high listening levels, and the receiver offers high sensitivity for weak-signal reception.

The Sangean CL-100 AM/FM/Weather radio lists for $79.95, but it has a street price between $60 and $70 from *MT* advertisers.

Antenna Designs for VHF, UHF and Microwave

By W. Clem Small, KR6A

This month we'll be discussing antennas for "higher frequencies." For our discussion these "higher frequencies" are the frequencies above 30 MHz. So this month, when we mention "lower frequencies," we are referring to frequencies below 30 MHz: the HF (shortwave) band and lower.

Compared to the lower frequencies, the even shorter wavelengths of very high frequency signals can allow dramatic reductions in antenna size. This is particularly true at UHF (ultra-high frequencies) and microwave frequencies. A half-wavelength antenna element designed for 3 MHz in the HF band is over 150 ft long. However, at 30 MHz that element would be about 15 ft long; at 300 MHz, around 1.5 ft; and at 3 GHz in the microwave band the same element would be less than 2 inches long!

The smaller size of the higher-frequency antennas means that, in general, they capture less energy from passing waves than do the larger, lower-frequency antennas of the same design. On the other hand, their smaller size makes it quite reasonable to construct more directive, higher-gain antennas than is practical at the lower frequencies.

Antennas at the lower frequencies can support world-wide communication via sky waves, and even by ground waves at the lower end of the spectrum. However, unless repeaters or communication satellites are used, communication on the upper frequencies is typically limited to what is called the "line-of-sight" between a transmitting antenna and a receiving antenna. A line-of-sight communication path must be free of obstructions such as hills, and stops a bit beyond our visual horizon. For maximum communication distance in line-of-sight work, mounting the antenna as high as is practical is usually desirable. (Check the line-of-sight web sites in the box for more on this.)

Probably the most popular non-directional antennas at the higher frequencies are the various versions of the ground-plane design. Vertical half-wavelength dipoles are also utilized at these higher frequencies. Vertical half-wavelength folded-dipoles are sometimes arrayed around a metal mast such that their combined patterns produce a non-directional radiation-reception pattern exhibiting some gain over a simple dipole. The gain is due to the mast serving as a reflector.

J-antennas, a type of end-fed vertical dipole, are also utilized at the higher frequencies. Wide-band, non-directional antennas, such as the discone, and bi-conical horn (fig. 1A) find frequent application at the higher frequencies.

Slot antennas are slots in a metal sheet where the area of the sheet is much larger than that of the slot. They are particularly adaptable to applications such as the metal skin of aircraft.

The whips and rubber duck antennas, used with hand-held transceivers and scanners, are non-directional by design. However, in practice, they are typically, but unintentionally immersed in an environment that includes conductive objects, including the radio operator's body. Thus their patterns are no longer fully non-directional. These antennas are usually very-low-gain designs, although variations such as the tiger-tail, quarter-wavelength, half-wavelength and the 5/8-wavelength designs provide some gain.

Patch or microstrip antennas (fig. B) are common today at the higher frequencies. These antennas consist of a metal plate separated from

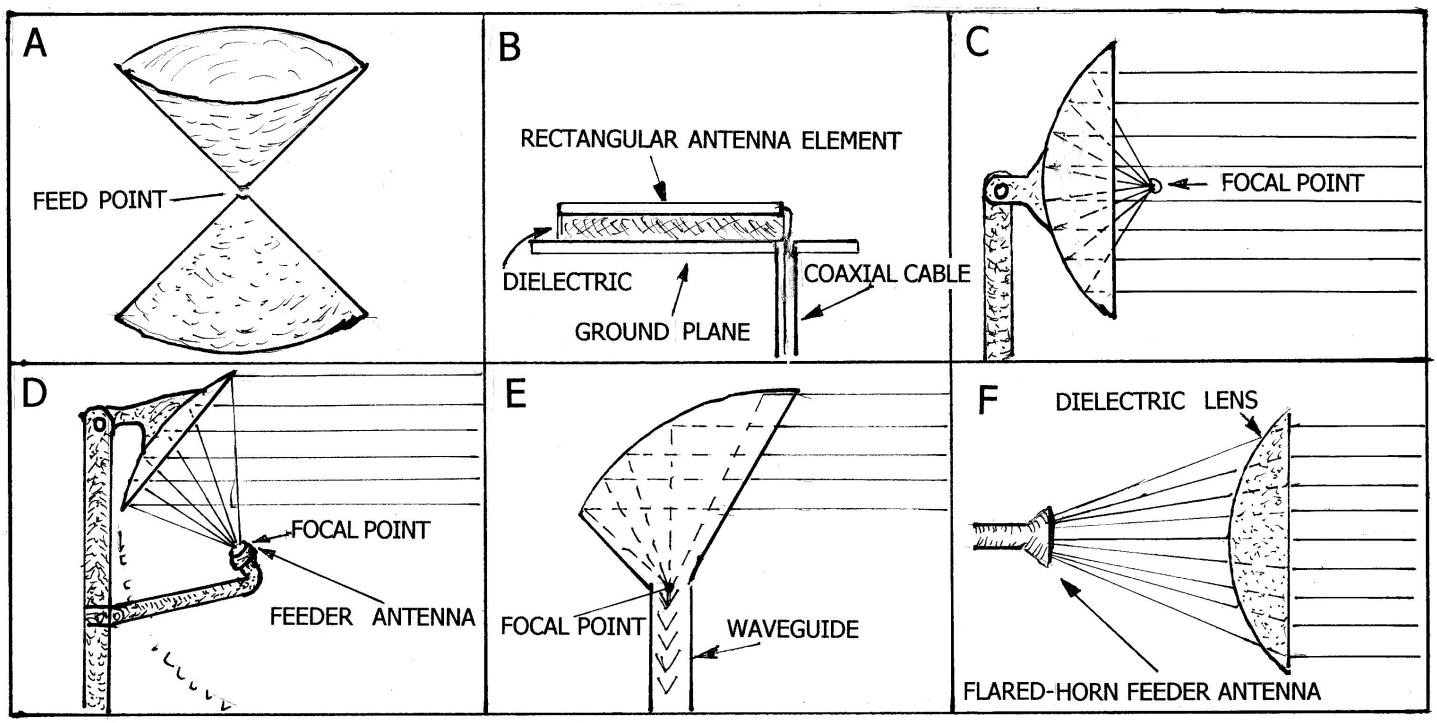


Fig. 1. A biconical antenna (A), a microstrip patch antenna with coaxial feed line (B), a parabolic-reflector with lines showing the path of radio waves it utilizes (C), an off-center fed parabolic-section antenna with non-obstructive feeder antenna (D), a Hoghorn feeding a waveguide (E), and a dielectric lens feeding a simple, flared-waveguide, horn feeder antenna (F).

a metal ground plane by dielectric (insulating) material. At UHF or higher they can be quite small, and are common in hand-held devices such as GPS receivers, as well as cell phone booster antennas, and LAN antennas.

The Yagi-Uda and the log-periodic dipole array (LPDA) beams are beam antennas quite common on the VHF-UHF bands. Less common are the cubical-quad and the quagi: a design combining elements of the quad and the Yagi-Uda.

At microwave frequencies, directivity is often obtained by using reflectors such as a metal sheet or metal dish to direct waves to or from a small feed antenna. A "feed antenna" directs signal energy to (receiving) and from (transmitting) the antenna's feed line or waveguide. The feed antenna might be a dipole; Yagi, flared, open-end waveguide antenna; or other type antenna. Antennas utilizing such reflector designs include the panel, trough, corner, axial-mode helical, and the parabolic dish (fig. 1C).

For the dish antenna, a feed antenna is placed at a parabolic reflector's focal point; however, in this position the feed antenna blocks some of the incoming and outgoing signal. Constructing the reflector as only a portion of a larger parabolic surface, allows off-center placement of the feeder and avoids such signal blocking (fig. 1D). The cassegrain reflector allows positioning the feeder away from the focal point. This design is utilized where large feed systems with low-noise preamplifiers make positioning the feeder at the focal point complicated or unwieldy.

Horn antennas are useful at microwave frequencies. The simplest horn consists of simply flaring the end of the antenna's waveguide into a horn or funnel shape. The Hog-horn, or cornucopia (fig. 1E), is a high-gain microwave beam antenna. This horn antenna is basically an off-center fed section of a parabolic reflector which reflects radio waves into or out of a horn feeding the end of a waveguide. In this antenna the signal path (except for the wave's enter-exit opening) is shielded by the metal construction of the horn. The gain of the reflector antennas discussed above is generally high.

Less popular than the reflectors or horns are the lens antennas (fig. 1F). In lens antennas the signal is focused to a feed antenna, either through spacings between lens-shaped, parallel metal sheets, or through lenses made from dielectric material.

❖ In Conclusion

We have discussed a variety of antenna designs employed at the higher frequencies. However, looking through a comprehensive antenna-engineering handbook will reveal a many other designs available for use on these frequencies. In addition, we should keep in mind that essentially any antenna used at the lower frequencies can be scaled down to function on the higher frequencies.

For instance, the quarter-wavelength, earth-grounded Marconi antenna is adapted to higher frequencies by using the metal top of automotive vehicles in place of the earth. As another example, scaled-down versions of rhombic and V wire antennas, ordinarily used on HF and lower frequencies, are sometimes employed in remote areas for UHF-VHF TV broadcast reception.

But even with such a wide range of choices, the field of antenna design continues to evolve, and new designs are constantly being developed.

RADIO RIDDLES

What kind of radio antenna is designed so that it neither transmits nor receives? And why would we even want such an antenna?

Well, believe it or not, there are such antennas, and they are usually called "dummy antennas." Some made for the military were called "phantom" antennas: a name also currently used for some commercial antennas. Some dummy antennas are used for tuning transmitters when it is desired that no signal be radiated while adjusting the transmitter. Others are used in conjunction with a low-level signal from a signal generator to achieve a good impedance match at the receiver's antenna-input circuit while doing maintenance adjustments on the receiver's internal circuits.

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RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

Marc Ellis, N9EWJ
marcellis@monitoringtimes.com

Change of Pace: A Household Radio

Inspired by Lin Richardson's "Restoring Vintage Broadcast and Shortwave Sets" article in the July *MT*, I thought it might be fun to choose a household broadcast radio for our next restoration project. We haven't done one on these pages for some time, mostly because readers seem to prefer military and ham radio projects. So, consider this to be a trial balloon.

Let me know if you'd like to see an occasional broadcast radio, or more than an occasional one, among our future projects. I take readers' preferences very seriously! As for me, I'm going to enjoy working with a radio that doesn't practically require a forklift to maneuver into various servicing positions.

❖ About Our Radio

Not that our new project radio is exactly a lightweight. This Philco 38-62 table model weighs in at 17 pounds – a lot better than the 50 plus pounds of our previous project, but still a bit of a handful.

The Philco 38-62 as removed from attic storage.

According to *Philco Radio 1928-1942* by Ron Ramirez (Schiffer Publishing, 1993), the 38-62 was originally released as the 37-62 in 1937. With the model number and cabinet updated, the set was continued in 1938 because of Philco's greater emphasis on compact table models – with 17 models being offered in that year. A total of 56,000 37-62s and 38-62s were manufactured.

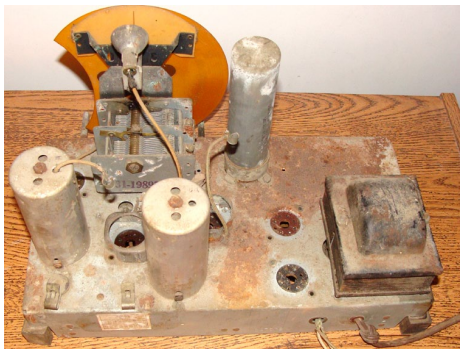
The Philco 38-62 is housed in an attractive art deco wood cabinet with rounded top corners and a speaker grille cutout resembling stylized lightning bolts. The front panel has a photographic veneer suggestive of various wood grains in rich inlay patterns. The tuning dial has a round bezel that harmonizes with the rest of the cabinet design.

The tuning system is a bit unusual. Instead of the usual pointer moving over a scale or drum rotating under a cursor, the 38-62 has a bright vertical line projected behind a translucent dial scale. The scale is rotated until the desired setting is over the line.

❖ Electronic Design

The 38-62 is a 5-tube a.c.-operated superheterodyne. The tube complement includes a 6A8 oscillator/first detector, 6K7 i.f. amplifier, 6Q7 second detector/first audio, 6F6 audio output and 5Y4 power supply rectifier. These tubes are all tall glass ("G" type) with octal bases.

As was typical of sets of this era, the speaker is a *dynamic* model. That is, it develops the necessary magnetic field from an electromagnet known as the *field coil*. In later sets, this function would be performed by a permanent magnet. The field coil is electrically energized by serving double duty as the power supply filter choke.



The chassis top is a bit discouraging, but we'll see what we can do with it.

Had this set been just a little more recent, it would likely have been equipped with an internal loop antenna. As it is, there are just antenna and ground terminals. But, at least in urban areas, the radio would very probably have provided decent reception with an antenna wire stretched under a rug and no ground.

The 38-62 has two tuning ranges: 1. 530-1720 kHz and 2. 2.3-2.5 MHz. The 1600-1700 segment band of 1 is labeled "Police" as is all of band 2. These were the original police bands. Today, 1600-1700 kHz is known as the "extended AM band," which became available as such about 1993. This can be quite handy for those who like to DX on vintage equipment. Most vintage AM sets cover only up to about 1550 kHz, the top of the original AM band.

Having antenna and ground inputs instead of an internal loop antenna might be a disadvantage for routine listening – but would certainly be helpful for those who might like to try DXing. However, this set would not really be the best choice for *serious* broadcast band DXing because of the absence of an r.f. amplifier stage.

❖ Initial Evaluation

The cabinet of our 38-62 is physically intact and sound. The photographic veneer on the front panel is mostly in good shape except for a small spot on the upper right corner where someone might have test sanded, not realizing that they were dealing with a paper product. The finish on the top and sides of the cabinet is rough and pitted in spots. The tuning and bandswitch controls work easily and the tuning capacitor moves freely. The action of the volume control is quite stiff.

A look at the back of the set revealed quite a bit of rust on the chassis, power transformer, and tube shields. This strongly suggested that the radio was once home to a family of mice.

Some debris left behind by this radio's previous occupants.

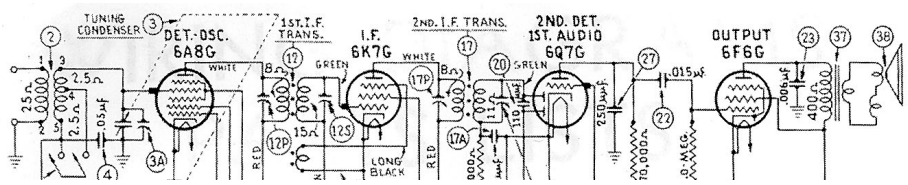
Removing the chassis involved sliding the three knobs off their shafts and removing the lone chassis mounting screw remaining of the original five. The wires running from the radio to the terminal board on the rear of the dynamic speaker also had to be disconnected – but only after making a little drawing of the board, recording which colors were connected where.

With the chassis out of the radio, the source of the rattling noises I had noticed every time I moved the set to a different position became clear. The mouse family had left quite a little collection of twigs, seeds, leaf debris and other goodies. The good news was that the underside of the chassis was quite clean indeed with no sign of tampering, modification or even parts replacement.

❖ Tube and Shield Removal

My next move was to remove the tubes and tube shields. A simple matter with some radios but not with this one! The tubes were held firm in their sockets by a grip of many years' standing helped along with a bit of corrosion. The three unshielded tubes were less of a problem than the ones with shields.

With the unshielded ones, I could work a screwdriver between base and chassis and pry gently in different spots until the tube was released.



The 38-62's basic tube lineup. Power supply and rectifier tube not shown.

With the two shielded ones, I obviously first had to remove the shields. These were seated on flanges installed over the tube bases and were virtually rusted in place.

There was almost no clearance for a prying screwdriver, and in the places where prying was possible, there was danger of bending the thin metal of the tube shields. The shields finally gave up after a lot of patient rocking back and forth, leaving me with the problem of removing the tubes. And it *was* a problem, because the tube shield mounting flanges made it impossible to get a screwdriver under the tube bases.

Once again, I was limited to gentle, patient rocking and pulling, praying that I wouldn't destroy the bond between glass and base. One tube eventually let go, but the other remained stubborn until I sprayed the tube contacts from below with contact cleaner/lubricant and let it sit for awhile.

The three tubes with top caps presented the additional problem of removing the spring connectors (also held by the grip of years) without breaking the caps loose from the glass. Once again, patience and praying – and some very careful screwdriver work – did the job.

All the tubes were filthy, so before testing them, I removed the grime with a damp rag – being careful to avoid the type numbers, which are very easy to wipe off. Once cleaned, they looked 200 percent better and, in fact, they all also tested good. As a matter of fact, during my many years of restoring radios, I can hardly remember a case where a tube needed replacing. Quite a tribute to the tube technology of days gone by!

❖ Electrical Tests

I never get too far into a radio restoration without checking the power transformer, if the set has one. A bad transformer is good cause to put the set aside until a proper substitute or a duplicate comes along. Back in the day, it was fairly easy to find replacement transformers of the correct voltage and current rating that would also be mountable in the spot occupied by the original. Today you need luck and a well-stocked junkbox!

Since the rectifier tube was no longer in its socket, I could power up the transformer without sending high-voltage d.c. through the set's circuitry. So, after making sure that the power switch was on, I inserted the radio's plug into a wall socket perhaps for the first time in fifty years.

My digital voltmeter showed a reading of a reassuring 630 volts across the transformer's high-voltage secondary. There was also a proper 5 volts at the rectifier tube filament connections and the expected 6.3 volts at the heater connections of the other tubes. The transformer might look like something the cat dragged in – or the mouse walked over – but it looked like it was still ready to do its job.

I was also quite interested in learning the condition of the loudspeaker field coil. A bad field coil wouldn't be grounds for putting off a restoration, because a permanent magnet speaker could be substituted for the dynamic one – with a power resistor of the correct d.c. resistance connected in place of a filter choke.

The field coil is extremely vulnerable. Since it *is* connected as a power supply choke, it can be easily burned out if a capacitor should short out anywhere in the B plus line. If this one was bad, I wanted to know about it so I could begin scrounging for the necessary replacement parts. But I needn't have worried; an ohmmeter connected across the field coil showed a resistance of 1200 ohms – close enough to the 1100 ohms specified in the Philco service manual.

❖ From Our Readers

Bill Bowers writes that he enjoyed "Starting Out in Radio – 1920s Style" (July 2010 issue) and that it brought back memories. He built his first receiver in 1936 using the regenerative circuit of Figure 5 in the article. His coil was wound on an oatmeal carton, with a smaller rotating tickler coil inside. "All the wire was salvaged from a Model T ignition coil. The tube was a type 99, later an 01A.

"The antenna wire was also from a model T coil. It was nailed along the telephone poles for nearly a block. The grid leak was a pencil line drawn on soft wood with a thumb tack connection at each end. It was amazing the stations I could receive.

"Since those days, I have continued to play with my radios but even with my ICOM R9500, JRC NRD-545, Harris 590 and R-75 I do not have as much fun or excitement as I did with my original one tube radio."

C.L. Hallmark, W5ZWM, tells me that he has been following the recently completed BC-344 restoration with a great deal of interest.

He recalls a BC-348R he received, years ago, from his "elmer" Bill, W5LX. Bill had added an outboard IF strip (six 85 kHz cans) on the back of the 348 to "improve its selectivity on CW" and, boy, did it work! Though it sure made AM signals sound "funny."

The receiver was so sharp that it was possible to tune into "zero beat" with your own transmitter signal, go out the other side, and not hear it! "C.L." worked many CW pile-ups with it before getting an SX-71 from Bill that had also been exposed to the "W5LX touch."

About a year or so ago, a friend found the old BC-348 somewhere and surprised him by dropping it off at his house. He was really pleased to get it back after all those years, but isn't sure if he will ever try to make it work again. He also has his first transmitter, a Heath AT-1, circa 1953.

Back last March, I received an e-mail from **Chuck Weigel**, a long-time *Monitoring Times* reader who had been following our BC-344 restoration. Chuck's e-mail had the intriguing title "A BC-342 For You." As the title implied, Chuck wanted to present his rarely-used BC-342 to me, with the idea that it would make a good follow-up for the recently completed BC-344 project.

The BC-342 (1.5- 18 MHz) is a sister radio to the BC-344 (150 - 1500 kHz) and is almost identical in appearance. I'm delighted to receive it and we have plans for me to pick the set up at Chuck's New York State location in mid August on my way to the Antique Wireless Association Convention in Rochester, New York. By the time you read this, the deed will be done and I'll be figuring out where to put it in the project queue.

That's a wrap for this issue! I hope you enjoyed the change of pace, and let me know what you think about more broadcast receivers in the future.

Increase the Charging Current for the Yaesu VR-500

By Mort Arditti NA6MA

Despite its age, the Yaesu VR 500 is still a fine scanner. It can use either regular disposable or rechargeable AA batteries. When it was introduced, the rechargeable batteries were 500 to 700 mAh capacities and the scanner's internal charge controller is limited to 30 mA. This low current was reasonable for these low capacity batteries. A 600 mA battery could be charged in approximately twenty hours, which is almost tolerable. However, this low charge current is grossly inadequate for the current generation 2000 - 2700 mAh, NiMH batteries. Charging these batteries at 30 mA would take 70 to 100 hours – clearly not acceptable.

My initial goal was to speed up the charging process without removing the batteries from the scanner. Being able to charge the high capacity batteries at 150-400 mA seemed a worthwhile objective. Modifying the internal charge controller appeared a good idea. However, a review of the schematic revealed that this approach was completely impractical. Access to the charge circuit would require almost a complete disassembly of the radio – not an exciting undertaking. The power dissipation of the charger controller circuit would be excessively high if one were to modify it for the higher current. Adding another parallel charge circuit was not practical, either. The internal charging voltage source is a boost DC to DC converter with limited capabilities. Obviously the internal modification was not a viable approach.

The last obstacle for the internal modification were the small surface contact areas between the battery compartment inner springs contacts of the battery compartment and radio's circuitry. The problem was the dependability of interface spring and pads on the printed circuit board at the higher charging currents.

Ultimately, the only viable choice was charging the batteries directly with an external charger, bypassing the spring contacts without removing them. After examining the case and battery compartment it appeared that this might be possible with minimal modifications. This solution required two external charging contacts on the rear case, an appealing scheme. After further investigation, the bottom of the rear portion of the case, right below the battery compartment was the choice location for the added contacts. These contacts were to be wired directly to the battery compartment interface. A blocking diode was essential to prevent the external contacts from being "hot."

Disclaimer

This modification requires precision light mechanical and electrical work and good soldering skill. Anyone performing this adaptation does so at their own risk and accepts full responsibility for the modification, all the work and results. The author only describes his efforts, and the method to accomplish the desired results and does not assume any responsibility.

Modification Procedure

The first step is to separate the back part of the case from the front. Do not force anything; doing so may damage the case. Follow the instructions below.

Remove the battery cover and batteries. Locate the four small screws holding the case halves together as shown in figure 1.

Remove the two self tapping screws, 1 and 2 on either side of the battery compartment. These screws are different from the other two screws 3 and 4 near the top of the case.

Next remove the two machine screws 3 and 4 near the top of the back cover. Keep a record for the screw types and location. This will be important during re-assembly.

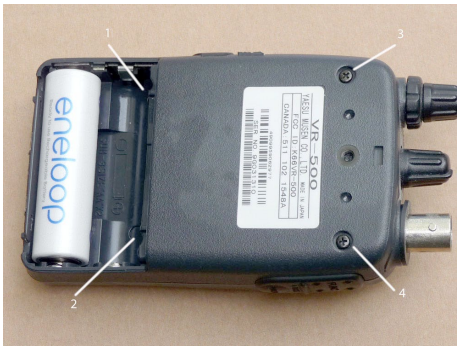


Figure 1. Screw locations

Start at the top! After removing the four screws, starting at the top of the scanner, separate the rear case cover from the front section. Carefully undo the two halves at the top end only: once the top halves are slightly apart (approximately 1/2 inch), slide the rear cover toward the top to disengage the two plastic tangs on the bottom. (Tangs are small hook like projections which engage the two case halves – they are delicate.) Do not attempt to lift the lower part of the rear case straight up until it has been moved slightly toward the top. Once the tangs are disengaged, lift the rear case straight up. All the modifications will be done on the bottom of the back cover.

First find suitable, relatively thin solderable metal contact material, approximately 3/16" wide and 3/8" long per contact. After some searching I settled on the metal strips used to interconnect the cells in an old rechargeable battery pack. The only issue with this metal is that it requires some extra effort to solder to it. This metal is thin, easy to shape and does not corrode.

Creating the contact area at the bottom of the case requires delicate work. Make two shallow grooves for the contacts as shown in figure 2.

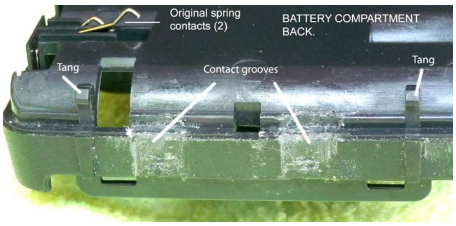


Figure 2. New contact grooves at bottom

The horizontal position of these new contact grooves are purposely off-center. This is in order to prevent reverse polarity when the scanner is in the charge cradle. The depth and width of these grooves is slightly deeper than the thickness of the contact metal and slightly wider to allow space for the epoxy adhesive. These grooves must be on the wall of the case as well as on the step above. The depth of the grooves must be adequate so that once the contacts are cemented in place, they will not protrude to prevent reassembly of the case. Figure 2 shows the two tangs and spring contacts mentioned earlier.

Shape the contacts to fit in the groves as shown in figure 3 and bond them in place with quality epoxy. For good adhesion of the metal contacts to the plastic case, all the interface surfaces must be slightly roughened and chemically clean. Use acetone to clean all surfaces.

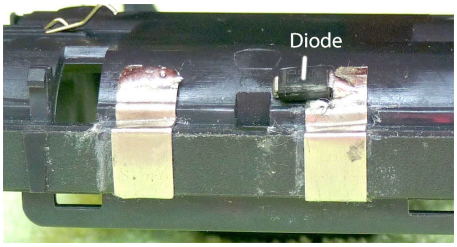


Figure 3. Contacts and diode in place

The surface mount diode is soldered at the top of the right (positive) terminal. The location of the diode is critical and must be as shown in order to allow reassembly of the case. Also, it may be necessary to slightly file down the diode's corners along the length – space is tight. After the

diode is soldered in place, apply a bead of epoxy to hold it in place.

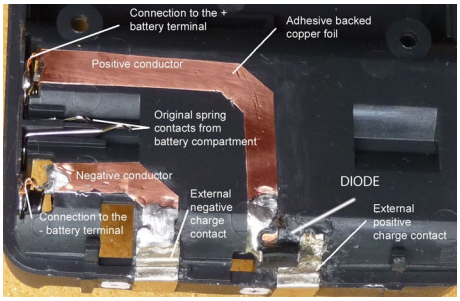


Figure 4. Battery compartment backside. New contacts, diode and copper foil conductors.

There is very limited space between the case back and the printed circuit board. A good "wiring" option is adhesive backed copper foil to connect the external contacts to the battery contacts. Solder the battery end of copper conductors to the battery terminals using stranded wire with a short loop as shown in figure 5.

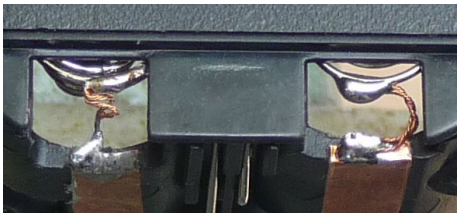


Figure 5. Battery contact to conductor connection

❖ Charging Cradle

With the direct charging contacts, it is useful to have a matching charging cradle. My choice was to make one out of epoxy formed in a small thin plastic container approximately 1 inch high (of the type used for small hardware) and using the scanner itself to create the cavity pattern.

Use extreme care in the following steps. Wrap the radio with a single sheet of sturdy plastic wrap large enough to cover the entire radio. Place the bottom of the radio in the center of the sheet of plastic wrap and fold it upward over the keyboard, sides and back. Press the wrap tight and repeat the same process with a second sheet of wrap. Once this is done, use masking tape to secure the plastic wrap horizontally tight against the radio just above the center and top of the keyboard. Use a third sheet of wrap and repeat the initial wrapping process. Use a 2 - 3 inch strip of plastic and wrap tight horizontally around the keyboard, flush with the bottom. The plastic wrapped scanner now becomes the "slug" for creating the cradle's cavity.

For the following steps, do a dry practice run first without the epoxy and set everything properly.

To create the cavity, the radio is immersed into an epoxy mix. It is necessary to keep it approximately 0.2" – 0.3" above the bottom to form a solid base. To do so, I used a male-to-male BNC adapter on the antenna connector, secured it to the chuck of a drill press and lowered the scanner to the proper height as shown in figure 6. The extra masking tape on the right is used to keep the scanner in a vertical orientation.

Note: If you are concerned about immersing the radio into the "epoxy bath," consider making a suitable wooden model of the radio's base and use this replica to create the cradle.

Once the epoxy has fully cured, the wrapped scanner is slipped easily from the solid epoxy and the clear outer form is also removed. Clean and shape the entire solid epoxy cradle with acetone and shape as necessary. Prepare a suitable plastic case by cutting a matching opening and attach the cradle from the bottom with epoxy. Allow adequate time for the epoxy to fully cure. Slightly enlarge the cavity to allow lining the inner wall with soft, adhesive backed felt to protect the VR-500 and it can slip in and out easily.

Figure 6. Wrapped VR-500 lowered into the epoxy.

The cradle housing requires an electrical contact base that matches the new contacts at the bottom of the scanner. I used a piece of 1/16 inch thick, single sided copper clad material. Remove a wide section of copper near the center, but slightly offset to match the added bottom contacts, and make a dual contact interface base. Locate some conductive spring material to make the contact. My choice for these contacts were the spring fingers from an RF gasket strip which was lying around. Look at discarded old cordless and cell phones. The cradle or battery compartments may have suitable spring contacts.

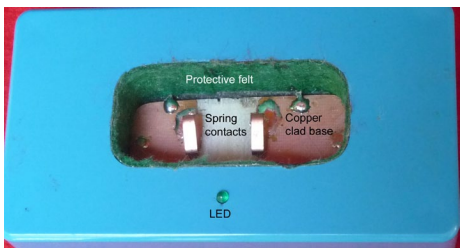
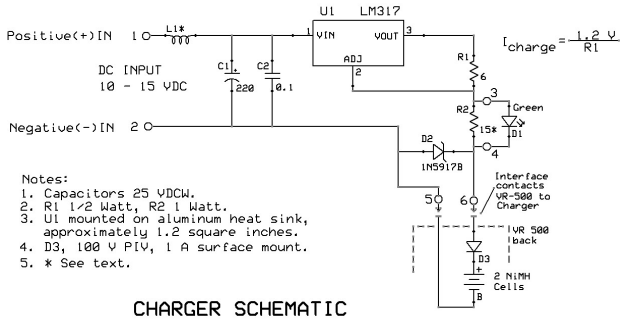


Figure 7. Charging base with interface contacts

Soft spiral spring will probably do; however corrosion (rust) may be a long term reliability issue.

❖ Charger

The charger circuit is a simple, constant current source. An LM317, U1 is used in a constant current configuration. The DC input can be from 10 to 15 VDC. The upper voltage is limited mostly by the heat dissipation of U1 and will depend on the heat sink. L1 in conjunction with C1 & C2 form a simple low pass filter in case the DC source is a switching noisy supply with large of noise spikes.



CHARGER SCHEMATIC

The value of L1 is a few hundred uH – not critical, as long as it can handle the charge current. Desktop computer power supplies have several such inductors; don't be afraid to take them apart. The voltage drop across R2, 15 Ohm is approximately 3 Volt for a green LED and can be 10 Ohm for a red LED. R1 sets the charge current according to the formula shown on the schematic.

The purpose of D2, 1N5917B (or equivalent) 4.7 V nominal, 1.5 Watt Zener diode is to protect the scanner by limiting the maximum voltage in case the battery load becomes open (dirty/corroded contacts, dead/open/no battery). Without the batteries, the maximum applied voltage will be approximately 4 VDC (4.7 V – V_{D3}). Keep your radio safe: do not omit this diode.

Figures 8, 9 and 10 show the charger circuit, mechanical configuration and installation inside the case.

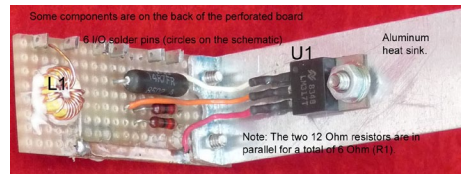


Figure 9. Charger, mechanical configuration

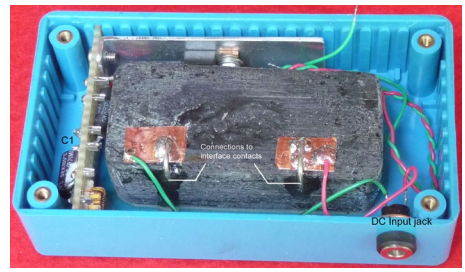


Figure 10. Bottom view with charger assembly in place

❖ Conclusion

Despite the significant effort for this project, the successful end result made it worthwhile. Now, it is convenient to recharge the batteries.

Figure 1 shows the batteries are the low self discharge type. The VR-500 is up in years but it still remains a fine, small, low power scanner. Using the higher capacity (2000 mAH), low self discharge batteries together with this modification enhances the utility of this scanner and the charging process.

What's NEW

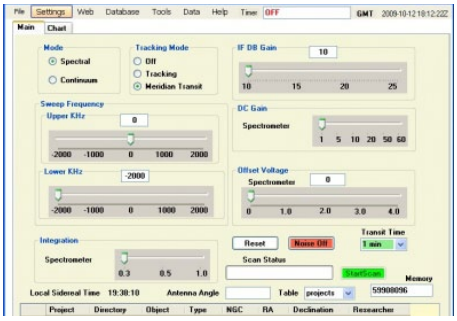
Tell them you saw it in Monitoring Times

Larry Van Horn, New Products Editor

SpectraCyber Elite Software

A new software package has been released for radio astronomy enthusiasts. SpectraCyber Elite© was developed exclusively for Radio Astronomy Supplies, LLC, by Ralph Boyd of the HighIQ Software group, for use with the SpectraCyber I/II™ Spectral and Continuum Radio Telescope.

The software is compatible with Windows XP/Vista running under Windows Net3.5 and Windows Compact SQL Server Express. It operates in a standard Windows state-of-the-art environment within a user friendly interface. The Windows Compact SQL Server is used to keep records on the statistics of the data set scans, while the actual data is stored in readable ASCII files to support user access.



Some new features include the new Project Mode research methodology where all files are stored under a common directory for the specific RF stellar source under study. The SQL database contains the astronomical data for the RF sources and is upgradeable by the user.

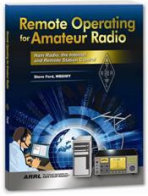
The main menu contains hot links to astronomical catalogs on the web. A new tracking timer mode has been added to support collecting data over preset time periods, including a continuous 24 hour/seven day diurnal mode.

Data is stored in both a RAW and XML format. The data even includes the GMT and Sidereal time that each signal value was acquired. The new internal Sidereal Time clock runs in real time synchronized to GMT and displays the local right ascension at the observer's local meridian in real time on the computer screen. There is even a new Sidereal Time calculator available to determine the most opportune time to observe a meridian transit of a specific stellar RF source at a future date and time.

Since the software now runs in XP/Vista (there is no support for pre-XP versions), one of the most exciting features is the ability to run the program remotely over the local LAN or Internet. Using web-based tools such as – **Go To My PC. com** or **LogMeIn. com** (a free Internet service), it is possible to log onto a remote PC that is running the SpectraCyber Elite software to execute a Doppler scan of a specific RF object. Of course the antenna must be pointing in the proper direction at the time. Just imagine being on a business trip and still being able to access your SpectraCyber system remotely via your cell phone or laptop!

You can get more details on this new powerful radio astronomy software package on the Radio Astronomy Supplies LLC website at **radioastronomysupplies.com**.

Remote Operating for Amateur Radio



By Steve Ford, WB8IMY

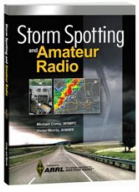
The ARRL has released a new book, *Remote Operating for Amateur Radio,* which guides you through the process of establishing your own Internet-controlled station. You'll learn the basics of how the Internet works, how home networks operate, and how to interconnect amateur radio hardware and software for remote Internet control. You'll find station diagrams, software tips and much more.

This book also addresses the legal aspects of remote station control, as well as the unique issues of remote operating as it applies to activities such as DXing and contesting. With more than 100 pages of solid, practical advice, *Remote Operating for Amateur Radio* is a guide to getting back on the air with the station of your dreams – even if you live in an apartment!

Contents includes: The Case for Internet Remote Control; Networks and the Need for Speed; Bringing the Internet Home; Hardware Integration; The Audio Challenge; The Listening Post; and Building a Complete Remote Station.

This new ARRL book lists for $22.95.

Storm Spotting and Amateur Radio



By Michael Corey, W5MPC and Victor Morris, AH6WX

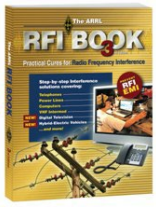
SKYWARN®, a program of sponsored by the National Weather Service, includes thousands of volunteer storm spotters who are on the first line of defense against severe weather. Amateur radio operators bring a lot to the storm spotting table, such as an established communications system that can remain operational during an emergency. Ham radio also has a pool of volunteers willing to be trained in storm spotting, a history of public service, and technology that no other organized group has.

Now amateur radio operators have a new reference publication to aid in storm spotting. *Storm Spotting and Amateur Radio* is a resource for the amateur radio operator who volunteers as a trained storm spotter. This book includes information on resources, training, equipment, safety, storm spotter activation procedures, reportable weather criteria, developing a local storm spotter manual, and the experiences of storm spotters from around the country. It also provides some meteorological information about severe weather such as hurricanes, tornadoes, hail, floods, damaging wind, and winter weather.

A comprehensive index is included with weather-related web sites and a state-by-state listing of SKYWARN web sites.

This new ARRL book lists for $22.95.

The ARRL RFI Book, 3rd Edition



If you are like most hams, radio frequency interference (RFI) has caused you grief on more than one occasion during years of amateur radio operations. If you are like me, you're probably not anxious to repeat any of your experiences trying to combat RFI generated during your ham radio operations. It is a problem that has been us for more than nine decades.

The best defense to combat RFI is to recognize the problem and treat the cause of the interference at the source. This requires a certain level of expertise that many of us do not have. But thanks to the ARRL, we have a reference publication to help us eliminate RFI problems during our ham radio operations.

ARRL's team of experts have compiled the best advice available on every type of radio frequency interference (RFI). From automotive to television, from computers to DVD players, from audio equipment to telephones, you'll find a step-by-step process for eliminating problematic interference in one convenient book. *The ARRL RFI Book* also includes resources for troubleshooting new technologies such as digital cable TV and satellite systems, over-the-air TV signals, and hybrid and all-electric automobiles.

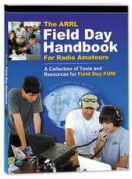
Some of the material covered in the 19 chapters of this book include: EMC Fundamentals, RFI Troubleshooting Techniques, Radio Direction Finding, Antenna Connected Televisions, Cable television Interference, DVD Devices and VCRs, Telephone RFI, Stereos and other Audio Equipment, How to resolve a power line noise complaint, External Rectification – "The Rusty Bolt Effect," "Intermod" – A Modern Urban Problem, Automobiles, Computers, and much more.

This new ARRL book lists for $29.95.

The ARRL Field Day Handbook for Radio Amateurs

ARRL Field Day is the largest on-the-air operating event in amateur radio. It draws tens of thousands of radio amateurs to the airwaves each year, bringing new and experienced ham radio operators together. Field Day is a radio operating activity, educational event, and public demonstration all rolled-up in fun! By setting up in parking

lots, parks, malls, emergency centers, and at home, hams develop skills to better serve the amateur radio service and their communities.

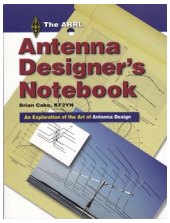


The ARRL Field Day Handbook is the ultimate guide for Field Day enthusiasts! This book features content from *QST* magazine and other ARRL publications, and includes everything you need to participate in this annual. The Considerate Operator's Frequency Guide, ARRL/RAC Section Abbreviations, ARRL/RAC Map, Morse Code Character Set, Antenna Projects from the Pages of *QST,* Tips for Field Day Power, Public Relations, Amateur Satellites, HF Digital Communications, and your Field Day Log.

This new ARRL book lists for $19.95.

Antenna Designer's Notebook

By Brian Cake KF2YN



For antenna experimenters looking for the highest gain at HF, VHF and UHF, the new *Antenna Designer's Notebook* by Brian Cake KF2YN is a must.

Its 200 pages are devoted to approaches to several antenna designs: Yagis, verticals, monopoles, large and small HF loops, and a treatment of dipoles as well. A CD of the book is included for quick and easy computer reference.

Published by the American Radio Relay League (ARRL), *Notebook* is considerably different from the League's ARRL *Antenna Book*; its approach is an experimental/evolutional design of a wide variety of models.

Nearly half of the book is spent on improving the Yagi; they are lengthened and arrayed, and there's quite an interesting treatise on the boxkite variant.

This volume is not a recipe book; it's a solid, theoretical and empirical approach to antenna design of lesser-known approaches. As such, it's not a tutorial for the newcomer to ham radio, but rather a technical engineering perspective on antenna design.

The work is lavishly illustrated with graphs and pattern charts, and while most anyone can understand the text – and can certainly build antennas from the contents – those readers who are interested in the math won't be disappointed!

The *Antenna Designer Notebook* is available for $34.95 plus shipping from the ARRL.

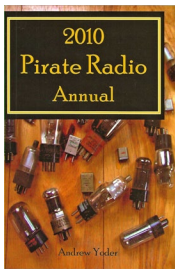
You can order all the ARRL books mentioned above via snail mail to 225 Main St., Newington, CT 06111-1494 or visit their website at **www.arrl.org**.

2010 Pirate Radio Annual

By Andrew Yoder

Anyone who has dabbled in shortwave listening, knows there is an underground component that borders on the quirky, if not bizarre side of the hobby.

Andrew Yoder, a pirate radio aficionado, has recently released his new *2010 Pirate Radio Annual*, a 126 page book focusing on the pirate side of the shortwave hobby. Whether you're a newbie or the seasoned hardcore pirate listener, this excellent edition will no doubt grace many radio listening posts (including mine).



So, what is the great mystery when it comes to tuning in pirates? It may surprise the beginner that it involves just listening! Andrew takes you through the pirate mine field explaining that listeners are no longer limited to their receiver, but now have access to the bizarre via the Internet. Additional information includes pirate web sites, QSLing pirates, mail drops and QSL tips to get you started.

"Classifying The Stations" includes an explanation of the various classifications of pirate stations and a 97 page section of stations active in 2009, with detailed station information, and their active status during the year. Email and postal maildrop addresses are included, plus QSL card reproductions for each station to keep you up to date on QSLing.

A CD, which is included, features actual recordings of 75 different pirate stations, a monitoring plus for those new to pirate chasing.

If you're a seasoned pirate fan or have considered delving into the sometimes bizarre, *2010 Pirate Radio Annual* is an excellent guide to assist your listening. The 2010 *PRA* is available for $15.00 plus shipping ($2.00 to US, $4.00 to Canada, or $9.00 to the rest of the world) from Cabinet Communications, P.O. Box 109, Blue Ridge Summit, PA 17214.

Reviewed by Gayle Van Horn, W4GVH

LETTERS

editor@monitoringtimes.com

This column is open to your considered comments. Opinions expressed here are not necessarily those of Monitoring Times. Your letters may be edited or shortened for clarity and length. Please mail to Letters to the Editor, 7540 Hwy 64 West, Brasstown, NC 28902 or email editor@monitoringtimes.com

Happy monitoring!

Rachel Baughn, Editor

Rachel Baughn
rachelbaughn@monitoringtimes.com

Vintage Radio

"Linton Robertson's article on vintage tube-era radios in the July issue was worth the price of a year's subscription! I'm sure that there are many *MT* readers like myself who were first exposed to radio monitoring via old 'floor model' sets like those he described.

"Considering the high tech (and often intimidating) technology that we must deal with today, vintage tube sets provide a happy return to an era when listening to the shortwave bands was a lot less complicated.

"I'm probably not the only *MT* reader who likes to DX on a restored tube-era set from the 1930s or 1940s, and who would appreciate more articles on vintage equipment and using it to monitor the airwaves. (And yes, you haven't really heard radio until you've heard it through a 12-inch electrodynamic speaker!)"

Eric Beheim

"I read the article on Vintage Radios in this month's issue. I thought the author did really well to cover the topic so thoroughly. It also provided so much enthusiasm in the subject, that it caused me to become interested in a subject that I never considered before."

Tim

Ham Radio Call-In Show?

"In the 1990's (before I obtained my amateur radio license) I used to listen to a shortwave radio station that aired a live call-in show for amateur radio enthusiasts. I believe the title was something to the effect of 'Ham Radio Today' or 'Ham Radio Now'. I want to say it aired from the southwestern United Sates and eventually ceased operation for budget reasons.

"Do you happen to recall this program and what station it aired on? Thank you for the help."

73, Ryan KC2LKS

Ryan, a search of the internet amazes me at how quickly some of this information can get lost. "Ham Radio Today" was the name of a CD narrated by Walter Cronkite which was produced by the ARRL to introduce the public to amateur radio, so I don't think that was the name of the show.

However, your question made me think of the online podcast on which Bob Grove was interviewed a couple of times, and it took a while to find what that show was called. Turns out it was "HamRadioCast.com" hosted by Mark Jensen. It seems that show no longer exists and I found no reference to it on line.

Apparently, Mark Jensen, alias Mark Titterington (or vice versa), now hosts a podcast called New Media Gear. The site says: "Podcasting, Streaming, NetCasting, Satellite Radio, Tube stations. It's all New Media – Although we may not realize it; terrestrial radio, television, and even the newspaper are all part of the New Media revolution. Traditional media is evolving into New Media. In this age of information overload, we must all be chameleons."

Ain't that the truth?! It sure applies to the radio hobby: Just read Larry Van Horn's comments on changing modes in the "Monitoring Secrets of the DX Pros" feature in this month's issue.

Can anyone help Ryan with his question about this ham radio broadcast?

We were also scratching our heads about a show Bill Henry We were also scratching our heads about a show on which he thought he heard Bob Grove, per his email below:

"Bob, really enjoy your radio show. I listen on Mississippi RRSM on Sunday nights. The void I hear in shortwave today vs. 1980's is the lack of Russian propaganda... You mentioned WRNO! Gosh I listened to that day and night here in Jackson, Mississippi.

"Did you ever listen to 'Beaker Street' on 1090 KAAY Little Rock Ark? With Clive Clifford. It's now called Almighty 1090 KAAY church radio.

"Well, thanks for your show. I will be tuned in."

Bill Henry W5HAN

The mystery was cleared up when I looked up "RRSM." Bill apparently listens to *Monitoring Times* being read on Sunday nights via the Radio Reading Service of Mississippi! It was news to us, and we are honored to have *MT* read on a regular basis! Beaker Street and Clive Clifford were on KAAY (the original Mighty 1090) in the late 60s and early 70s and the subject of a feature article in the February issue of MT.

MT Express on the iPad

"I'm probably not the first to tell you this, but…

"I just bought an iPad. When I downloaded *MT Express* I copied it to my Dropbox folder. Then I opened the Dropbox app on my iPad, clicked on *MT Express*, clicked on open with the iBooks app, and now *MT Express* is in my iBooks bookcase. Open it there and it reads perfectly."

Joe Marshall, *Lynn Haven, FL*

Hey, who needs a Kindle when you have an iPad? On the other hand, do you have a Kindle and wish *MT* were available in that format? Let us know!

Bringing Back Memories

Amateur radio is a small world: Following the July *First Person Radio* feature Bob Grove wrote on Ott Fiebel, he received this email from Jim Neigh:

"Bob, I wanted to tell you that I have been a ham for 51 years this year and I have subscribed to your fantastic magazine since 1974 when I was living and working in Jupiter, Florida. After I retired as a police officer, my wife and I moved to Sugar Mountain, North Carolina where I retired once again as a 911 Communicator for Avery County with ten years.

"We hated to leave the mountains of NC, but I had come down with Parkinsons and so we moved out here to Mount Carmel, Illinois. I saw an article about my good friend Ott Fiebel W4WSR who used to live there in Jupiter, Florida on Loxahatchee River Road. He had a terrific shack down there, but I never did get to see his new one there in Hayesville NC.

"Ott is a great guy and has helped me more than once with ham equipment. I have talked with Ott since moving out here to Illinois on occasion as there are a few hams still down there in Florida that I knew.

"Bob, I would love to see even more articles in your magazine about amateur radio and, of course, scanning. I have had many scanners in all these years and they sure have come a long way in coverage and types of trunking. Thanks for listening and keeping all of your readers updated."

Jim Neigh K4HHN

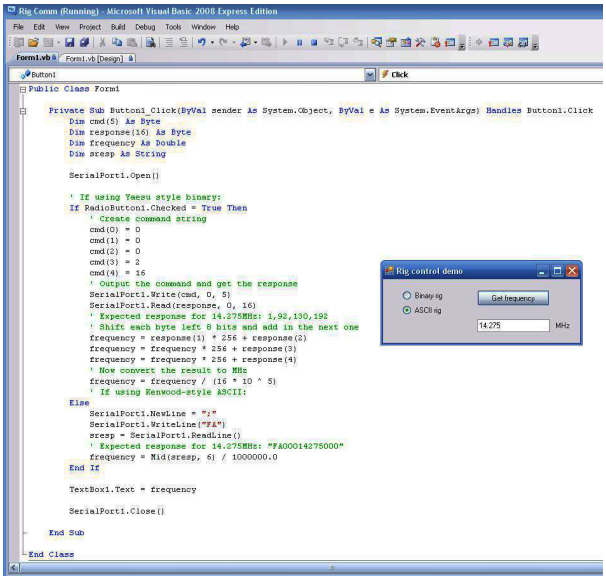
Hi, Jim: It's good to hear from you. Yes, Jupiter was, indeed, Ott's residence in Florida – while I was living in West Palm Beach and Ft. Lauderdale! He and I met through the local ham radio club here in NC several years ago.

I know Ott will be pleased to hear from you. Thanks, too, for your endorsement of more articles like this. Our editorial staff appreciates them so they can determine what themes are of interest to our readers.

73, Bob W8JHD

DZKit Support

Mike Hoblinski wrote to Brian Wood, whose company, DZKits, was the subject of a feature article in the October 2009 issue of



MT. He also writes the quarterly column on *Computers & Radio* in *MT*.

Brian sent Mike an original screenshot for Figure 3 from the April issue on writing your own command programs. The copy was so small in the magazine, it unfortunately could not be read without enlarging it 400% (via the *MT Express* pdf version)! If other readers want the enlarged jpg, write Brian at *brianwood@monitoringtimes.com* or *editor@monitoringtimes.com* and we'll get it to you.

"I read your article and was experimenting with Microsoft Visual Basic 8 and my R-5000. I set up some simple programs to send commands like turn the radio on and off, change antennas, change modes etc., but was having trouble reading and displaying the frequency in the box. Now that I have the Jpeg of the program to study that should help me a bunch.

"**Kit Comments**: I love it that there is another company offering ham radio receiver kits. I like the Elecraft K2, but your kit offers a few extras. I like the idea of being able to tune the whole shortwave band and the K2 does not offer this. I always enjoyed monitoring the utility and shortwave stations.

"I just wish it was cheaper to get started with the various kits. Perhaps a cheaper kit without the enclosure, or a more watered down version. I am the type of person who could build a receiver a piece at a time even though it would cost me more to do that! Maybe it's just me, but I can purchase a knob here, a coil there, a front panel, then a side! But I know this is hard to do in the new age of surface mount parts and the average kit builder. I do think that kit builders are getting more comfortable with surface mount soldering.

"I enjoy watching the new innovations with Software Defined Radios and have been following the HPSDR project.

"Again thanks for the Jpeg picture. I hope you write some more for *Monitoring Times*."

Mike Hoblinski N6IMF

Zip Code Scanning?

"Hello Larry: Name here is Tim Martin and I live in Falls Church, Va...maybe 10 miles or so outside of Washington D.C.

"I just got my August issue of *MT* and I see where you will be reviewing the new Home Patrol Radio from Uniden. I am looking forward to reading your review, especially on how a user will program this thing using zip codes, but without a GPS.

"Within a ten mile radius of the White House there are 118 zip codes...the Pentagon has at least 5 that I have identified.

"A second concern is where a jurisdiction uses the facilities of another jurisdiction for its radio communications.

"Falls Church (zip code 22046, 22041, 22042, 22043 and 22044) has four talk groups on the Arlington County (22201, 22209, 22210, 22203, 22216, 22202, 22211, 22207, 22213, 22205, 22219, 22206, and 22204) system for just the police communications. For fire service, Falls Church relies exclusively on the Arlington County fire department. How might a user know of this mish-mash?

"Good luck to us all!"

Tim Martin

Tim, thank you for your interest in Home Patrol and being a subscriber to *Monitoring Times*.

Basically, in a nutshell, it doesn't load just the stations within one zip code, but multiple zip codes, using a radius from the center zip code the user defines. That geo radius can also be controlled by the user. Right now, the units we are testing cast a fairly wide net, but these are engineering units. I can travel with just my zip code load which loaded stations from portions of five states and I don't have to reprogram a thing. It is actually quite neat.

So, if the station is in the RadioRef database and it meets the geo related parameters you have established, it loads, regardless of what system they are on. For instance, suppose I load the NC Johanna Bald VIPER site; even though it is in Cherokee Co here in western NC, if Macon Co – two counties away from us – uses the system, I will still hear it. That is because HP loads the entire VIPER system associated with western NC, not just the Cherokee users of the JB site on the statewide system.

Thanks for the email, 73 and good hunting. Watch for the full Home Patrol review in the October issue of *MT*!

Rachel Baughn

EDITOR'S SOAPBOX

Banish Anxiety: Subscribe!

by Rachel Baughn
MT Managing Editor

I had to laugh … I had just received another of those emails asking if *MT* is still in business because one reader couldn't get his usual issue from the usual source. Often this is a subscriber whose magazine didn't arrive in the mail one month, but in this case, the reader had been to three bookstores on the 20th of July and couldn't find the July issue, though he did find several June issues.

To his credit, this reader didn't post his query "Are you still publishing?" to a yahoo group: he actually addressed it to the editor. The majority never seem to think of going to the source. Or if they do and they get an answering machine over our lunch hour (which is now 11:30am to 1:00pm), they may conclude that Grove Enterprises is also out of business!

This enquirer did discover one fact of life: The newsstand is not a reliable supplier for your *Monitoring Times* fix. Bookstore managers and periodical distributors, the folks who take and fill the bookstore orders, all have different policies. Some managers order only two or three copies of *MT* each month. If you weren't among the first two or three readers through the door when the issue arrives, you would think that the bookstore no longer carries *MT*, which is why he couldn't find a copy. It's remotely possible their batch got trucked late from the distributor, and therefore never got put on the shelf. Or, the distributor may have decided to send the magazine to a different set of stores – all possible scenarios over which *MT* has no control whatsoever.

The only foolproof way to ensure delivery of *MT* is to purchase your own subscription – whether in print or pdf. Sure, even this method can occasionally go awry, but at least one phone call or email will soon get you a free replacement. Why bother getting your issue any other way?

Monitoring Times has been published for nearly 30 years without missing a deadline. Reckon a year will ever go by without someone missing their *MT* and asking, "You guys still publishing?"

More to the point, we remain thankful our readers notice when they can't get their *MT*! If you want to do your part in making sure we continue to publish and you get your favorite magazine every month: *Subscribe!*

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Columnist Blogs and Web Sites

These blogs and web pages were created by some of our columnists to better serve their readers. While we highly recommend these resources, they are not official instruments of Monitoring Times.

AMERICAN BANDSCAN
http://americanbandscan.blogspot.com/ - by Doug Smith

FED FILES
http://mt-fedfiles.blogspot.com/ - by Chris Parris

MILCOM
http://mt-milcom.blogspot.com/ - by Larry Van Horn

LARRY'S MONITORING POST
http://monitor-post.blogspot.com/ - by Larry Van Horn

SCANNING REPORT
http://www.signalharbor.com/ - by Dan Veeneman

SHORTWAVE
http://mt-shortwave.blogspot.com/- by Gayle Van Horn

UTILITY WORLD
http://mt-utility.blogspot.com/- by Hugh Stegman
www.ominous-valve.com/uteworld.html

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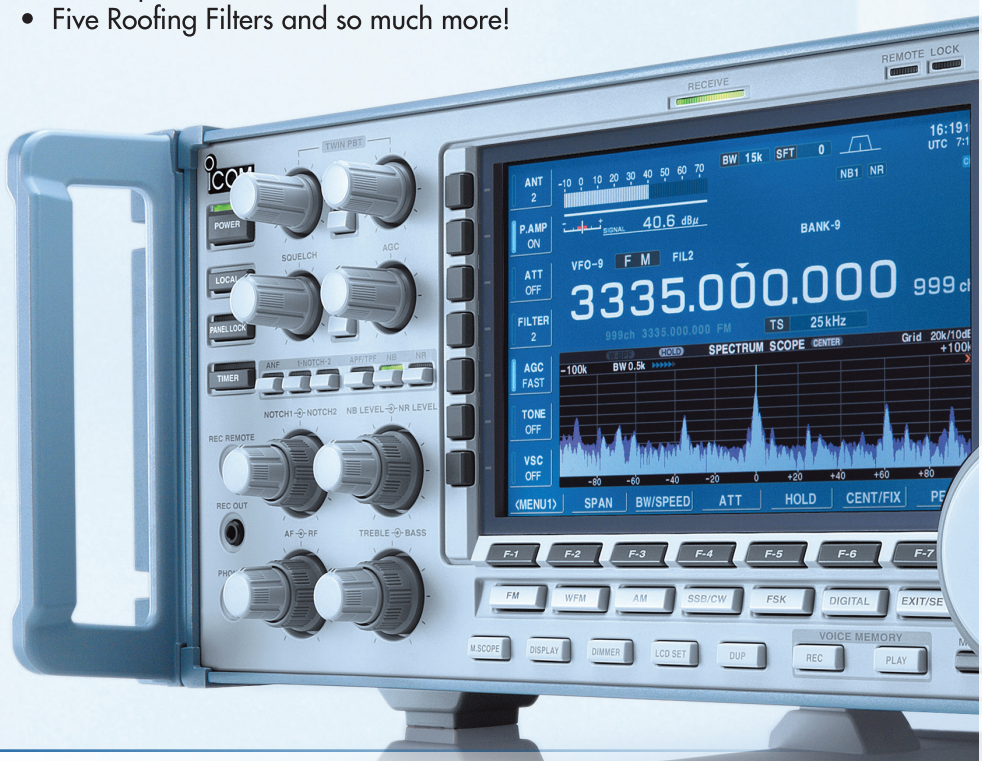

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